MRID: 50904801

TITLE

Indaziflam Minor Use Registrations Petition for 3 Years Extension of Exclusive Use Data Protection Provided Under FIFRA Section 3(c) (1) (F) (ii)

COMPANY PRODUCT CODE

Indaziflam

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GUIDELINE REFERENCE

None

COMPLETED ON

July 26, 2019

REPORT NUMBER:

US0771

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Pages

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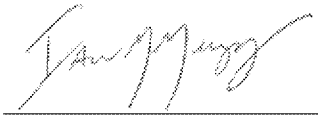
Submitter: Signature  Date: 2019-07-26 (YYYY-MM-DD)

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This document is informational, and is not the result of a study as defined by 40 CFR 160.3. Since the document does not report a study, no GLP (40 CFR 160 *or* Current OECD Principles of Good Laboratory Practices) statement is required as per PR Notice 2011-3 (VI)(C)(3), p. 11.

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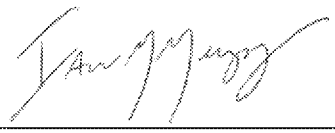
Sponsor/Submitter:  Date: 2019-07-26
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Typed Name of Signer: Ian Murphy

Typed Name of Company: Bayer CropScience

Table of Contents

1.0 Introduction

Bayer CropScience hereby respectfully petitions EPA to extend the period of exclusive data use for indaziflam herbicide by 3 years, by applying the provision of FIFRA Section 3(c)(1)(F)(ii).

FIFRA Section 3(c) (1) (F) (ii) states that:

> *The period of exclusive data use provided under clause (i) shall be extended 1 additional year for each 3 minor uses registered after the date of enactment of this clause and within 7 years of the commencement of the exclusive use period, up to a total of 3 additional years for all minor uses registered by the Administrator if the Administrator, in consultation with the Secretary of Agriculture, determines that, based on information provided by an applicant for registration or a registrant, that –*
>
> > *(I) there are insufficient efficacious alternative registered pesticides available for the use;*
> >
> > *(II) the alternatives to the minor use pesticide pose greater risks to the environment or human health;*
> >
> > *(III) the minor use pesticide plays or will play a significant part in managing pest (weed) resistance;*
> >
> > *(IV) the minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

1.1 Indaziflam Registrations

Indaziflam technical (EPA Reg. No. 264-1129) was first registered by the U.S. EPA on July 26, 2010. The formulations of indaziflam - Alion® 200 SC (EPA Reg. No. 264-1106) containing 1.67 lbs indaziflam per gallon and Indaziflam 500SC Herbicide (Alion HL, **Appendix 2**), a suspension concentrate containing 4.16 lb ai per gallon (500 g ai/L)is registered and approved for use in a variety of crops including the following minor use crops detailed in this document: cherries (sweet), pistachios, lemons, pears, and olives. Alion 200 SC has the least restrictive "CAUTION" labeling, no restricted-entry interval for any uses, and the pre-harvest interval (PHI) is 7 days for citrus and 14 days for all other crops listed on the label.[1]

Bayer CropScience believes that indaziflam meets one or more of the four criteria above based on certain currently registered uses for crops originally listed above plus certain new "minor-use" label expansion uses recently granted by EPA as a joint review with Canada. The EPA minor-use crop uses were granted on July 5, 2017[2]. Label expansion uses for caneberries (raspberry), bushberries (blueberries, highbush), hops, and coffee were completed with IR-4 primarily due to the potential fit with the extension of exclusive use program. The current Alion 200 SC label with these new uses is included in the appendix.[3]

Indaziflam in its formulated products Alion 200 SC and Alion 500 SC has brought and will bring control of key broadleaf and grass weeds for which there are few or no effective alternatives due to overdependence and overuse of "at risk" herbicides such as glyphosate

(an EPSP synthase inhibitor herbicide) and rimsulfuron (an ALS-inhibitor herbicide). Fleabane, horseweed and Italian ryegrass have developed resistance to glyphosate in TNV crops in California, for example. To control glyphosate-resistant weed populations, growers have increased use of residual herbicides such as flumioxazin and rimsulfuron, as well as other non-glyphosate postemergence herbicides. Unfortunately, repeated use of any herbicide mode of action increases the risk of resistance development that deprives growers of effective herbicide alternatives for control. ALS-inhibiting herbicides, such as rimsulfuron, in particular, are at high risk for resistance development, and weeds resistant to ALS, protoporphyrinogen (PPO), photosystem II (PSII) inhibitor, and bipyridilium herbicides have been identified in other crops in the U.S. Effective new herbicides are needed to manage serious resistance issues in TNV crops. Indaziflam will improve long-term resistance management and protect the longevity of all herbicides used in established TNV crops by applying it in tank mix and alternative spray programs as outlined by HRAC / WSSA guidelines for herbicide resistance management.

Broad spectrum control, effectiveness, extended control, a novel mode-of-action with no known cross-resistance, and favorable human health and ecological profiles make indaziflam an excellent fit in Integrated Pest Management (IPM) and integrated weed resistance management (IWRM) programs. Indaziflam has become a welcome addition in the weed control arena and serves as a valuable tool for weed management on a variety of established TNV crops.

1. **ALION 200 SC label.** (Appendix 1).

2. **ALION 500 SC label.** (Appendix 2).

1.2 Indaziflam Mode of Action and Weed Resistance and Implications for Weed Resistance Management

Considering that criterion III emphasizes management of pest (weed) resistance, the following is a brief description of the mode of action of Indaziflam.

Indaziflam (BCS-AA10717, AE117437, Alion) is a relatively new alkylazine herbicide for preemergence control of grass and broadleaf weeds in established tree fruit, nut, grape, olive, caneberry, and bushberry crops, hops, and coffee. Indaziflam provides extended residual preemergence control of the most common and economically important annual grass and broadleaf weeds, including populations that are resistant to glyphosate, triazine and acetolactate synthase (ALS)-inhibiting herbicides. Indaziflam controls weeds by inhibiting cellulose biosynthesis and meristematic cell growth. Indaziflam controls weeds prior to emergence from the soil, has limited postemergence (foliar) activity and may be mixed with postemergence herbicides such as glufosinate and glyphosate to control existing vegetation.

Indaziflam is formulated as Indaziflam 200SC Herbicide (Alion®, **Appendix 1**), a suspension concentrate containing 1.67 lb ai per gallon (200 g ai/L) and as Indaziflam 500SC Herbicide (Alion® HL, **Appendix 2**), a suspension concentrate containing 4.16 lb ai per gallon (500 g ai/L). Bayer CropScience has obtained the registration of Alion on citrus, pome fruit, stone fruit, grapes, tree nuts, olives, caneberries, bushberries, hops, and coffee. Indaziflam 200 SC will be applied at rates between 3.5 to 6.5 fl oz/ac (51 and 95 g ai/ha) for broad spectrum annual grass and broadleaf weed control including hard-to-control weeds like hairy fleabane,

horseweed, pigweed species, filaree, annual sow-thistle, foxtail species and Italian ryegrass, glyphosate-resistant populations of fleabane, horseweed and Italian ryegrass, triazine resistant common groundsel, and other resistant weed populations.

Indaziflam controls weeds by inhibiting cellulose biosynthesis (CBI). Its primary sites of action are inhibition of seed emergence and inhibition of root development. The roots of young seedlings that come in contact with the herbicide following germination are killed. In some cases, necrosis or yellowing may be observed if the herbicide is applied to herbaceous tissue such as leaves and green stems.

Indaziflam (provides preemergence, residual control of a broad spectrum of grass and broadleaf weeds when applied prior to germination. Best weed control is obtained when indaziflam is applied prior to seed germination and adequate rain or irrigation is received soon after application and prior to weed germination. It may be applied anytime when the ground is not frozen or covered with snow. Weed seeds and seedlings must come into contact with Indaziflam (Alion) 200 SC Herbicide prior to emergence to be controlled.

The herbicide needs to be activated prior to weed germination for most effective control. For maximum weed control, indaziflam requires rainfall or irrigation (minimum of about 0.25 inches) after application to activate the herbicide. Indaziflam will generally not control weeds that have emerged.

Indaziflam is currently classified as the only Group 29 Herbicide, "Inhibitor of cell wall synthesis site C" by the Weed Science Society of America (WSSA)[1]. No known resistance to indaziflam herbicide exists, and there are no known instances of cross resistance between indaziflam (Alion) herbicide and any other classes of herbicides or modes of action. Performance of indaziflam herbicide is not affected by the presence of biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action. Indaziflam is currently an important and integral component in IWRM programs where widespread resistance to other herbicides is documented. The use of herbicides with different modes of action in the tank mixture, rotation, or in conjunction with alternate cultural practices can help prevent the development and spread of resistant weed populations.[2]

Bayer is commited to stewarding indaziflam to ensure its availability to manage problem weeds for the long term. The benefit and value of indaziflam is endorsed by the grower community as demonstrated by the letters of support (**Appendix 3**).

1. WSSA Herbicide Site of Action Classification List (updated 2018). (**Appendix 4**).

2. HRAC webpage. http://hracglobal.com/tools/classification-lookup

1.3 Weed Resistance Management Labeling for Indaziflam

The Indaziflam 200 SC and Indaziflam 500 SC labels include voluntary weed resistance management language concerning the use of the product to encourage proper usage by growers. The label displays on the front page the WSSA box designator symbol "**Group 29 Herbicide**" so growers know what other products have the same mode of action and are not ideal rotational partners with Indaziflam 200 SC. The following text is also included on the Indaziflam 200 SC label which provides tactics to avoid resistance development.

"Resistance Management
Indaziflam, the active ingredient in this product, is a Group 29 herbicide based on the mode of action classification system of the Weed Science Society of America. A given weed population may contain plants naturally resistant to Group 29 herbicides. Such resistant weed plants may not be effectively managed using Group 29 herbicides but may be effectively managed using another herbicide alone or in mixtures from a different Group and/or by using cultural or mechanical practices. However, a herbicide mode of action classification by itself may not adequately address specific weeds that are resistant to specific herbicides. Consult your local company representative, state cooperative extension service, professional consultants, or other qualified authorities to determine appropriate actions for treating specific resistant weeds."

2.0 Proposed Minor Use Crop Registrations for Indaziflam that Qualify for Exclusive Use Data Protection

Table 1 lists the minor use crop registrations detailed in this petition including crop planted acres, corresponding MRID number and PRIA dates, qualifying weeds, and the exclusive use data protection criteria satisfied by indaziflam. All of the minor use crop candidates were registered within the requisite seven years period after July 26th, 2010, the date of first registration of the active ingredient indaziflam. All of the crop candidates are grown on less than 300,000 acres per year, as reported by the USDA-NASS or University experts.

Table 1: Minor Crop Registrations, Planted Acreage, Weed Groups Controlled by Indaziflam, PRIA Date and Exclusive Use Data Protection Criteria Satisfied by Indaziflam

MINOR CROP REGISTRATION	BEARING ACRES (YEAR)	APPROVAL DATE (MRID#)	WEED GROUPS CONTROLLED BY INDAZIFLAM	CRITERIA SATISFIED[A]
Cherry, sweet (*Prunus avium L. ssp./var. aviu*)	93,866[B] (2017)	04-07-2011 (47743403)	Grasses and Broadleaves	*III, IV*
Pistachio (*Pistacia vera L.*)	247,872[B] (2017)	04-07-2011 (47743404)	Grasses and Broadleaves	*III, IV*
Lemon (*Citrus limon L.*)	59,001[B] (2017)	04-07-2011 (47743405)	Grasses and Broadleaves	*III, IV*
Pear (*Pyrus communis L.*)	51,435[B] (2017)	04-07-2011 (47743402)	Grasses and Broadleaves	*III, IV*
Olive (*Olea europaea L.*)	40,915 [B] (2017)	04-07-2011 (47743407)	Grasses and Broadleaves	*III, IV*
Blueberry, highbush[C] (*Vaccinium corymbosum L.*)	97,515 [B] (2017)	7/5/2017 (49752802)	Grasses and Broadleaves	*III, IV*

Table 1: Minor Crop Registrations, Planted Acreage, Weed Groups Controlled by Indaziflam, PRIA Date and Exclusive Use Data Protection Criteria Satisfied by Indaziflam (continued)

Raspberry (*Rubus idaeus L.*)	20,646[B] (2017)	7/5/2017 (49752803)	Grasses and Broadleaves	*III, IV*
Hop, common[D] (*Humulus lupulus L.*)	59,429 [B] (2017)	7/5/2017 (49752804)	Grasses and Broadleaves	*III, IV*
Coffee, Arabic (*Coffea arabica*)	8,441[B] (2017)	7/5/2017 (49752801)	Grasses and Broadleaves	*III, IV*
Lime (*Citrus aurantifolia)*	1051[B] (2017)	04-07-2011 (47743405)	Grasses and Broadleaves	*III, IV*
Cherry, tart (*Prunus cerasus L.*)	35,944[B] (2017)	04-07-2011 (47743403)	Grasses and Broadleaves	*III, IV*
Apricots (*Prunus armeniaca L.*)	12179 [B] (2017)	04-07-2011 (47743403)	Grasses and Broadleaves	*III, IV*

[A.] Criterion *(III): the minor use pesticide plays or will play a significant part in managing pest resistance. (IV) the minor use pesticide plays or will play a significant part in anintegrated pest (weed) management program.*

[B.] Harvested/Bearing Acres available through USDA – National Agricultural Statistics Service. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS; and
Fruits and Nuts Table:
https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_US_State_Level/st99_2_0031_0031.pdf;
Berries Table:
https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_US_State_Level/st99_2_0033_0033.pdf
Other Crops Table (for Hops):
https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_US_State_Level/st99_2_0027_0027.pdf

[C.] Tame Blueberries.

[D.] Harvested Acres.

2.1 Notes:

Details of how Indaziflam meets the exclusivity criteria for each minor use are provided in the following sections using the following format (x = section number).

x.0) Justification of the Need for Indaziflam to Control Key Weeds in the Minor crop(s)

x.1) Minor crop(s) acreage

x.2) Exclusive Use Data Protection Criteria Indaziflam Satisfies in the Minor Crop(s)

x.3) Section References

When the reference is attached within a separate appendix, the file is indicated by: "(Appendix #)."

Some references to websites may be accessed when online by clicking the underlined link and the Ctrl key at the same time. APS, CDMS, and Agrian databases may require log in or new user registration to access the search functions.

3.0 Justification of the Need for Indaziflam to Control Key Weeds in Cherry (Sweet)

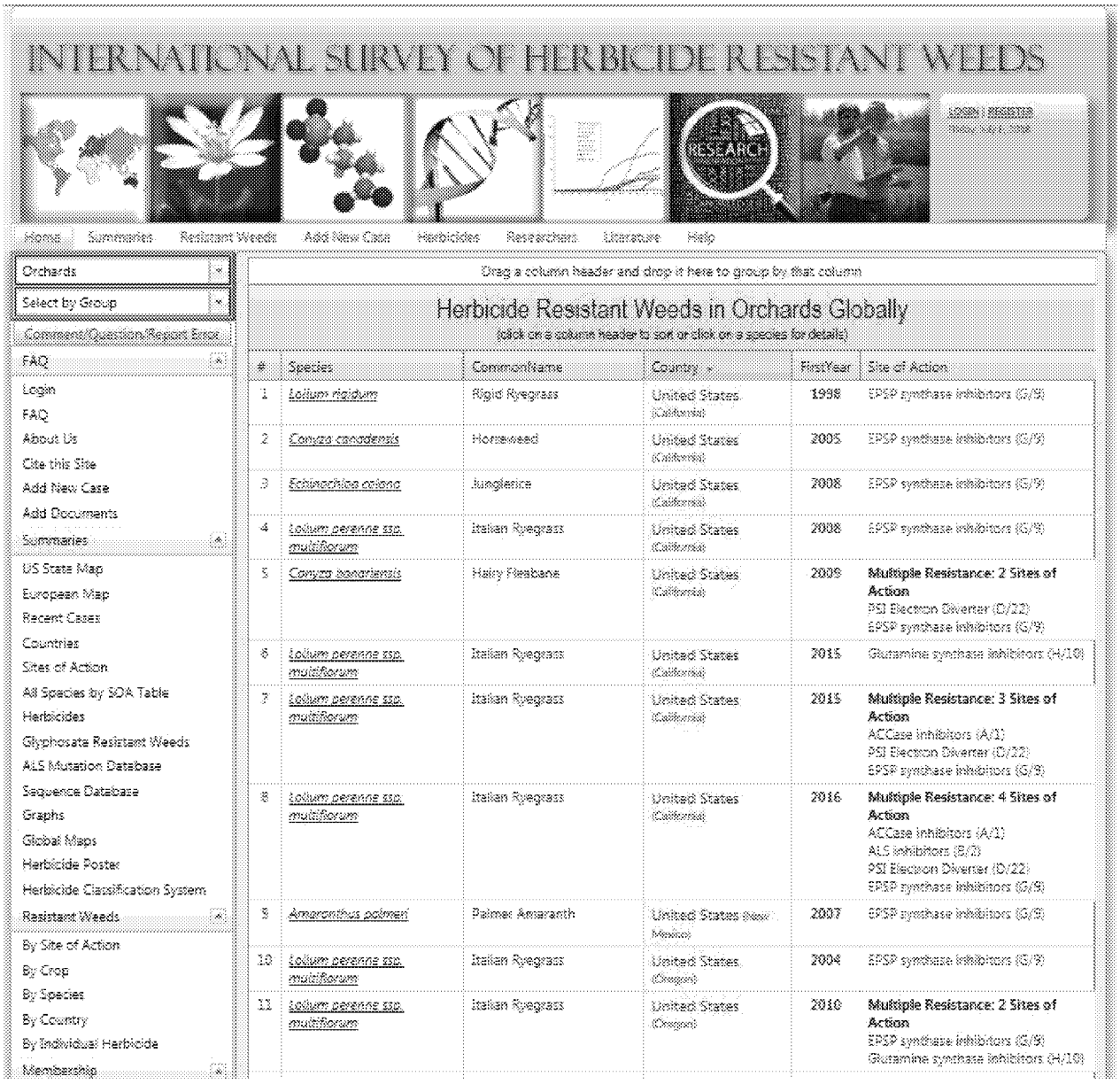
3.1 Cherry (Sweet) Acreage

Sweet cherries are an important commercial U.S. crop. Most sweet cherries are grown in the states of **Washington** (37,784 acres of bearing), **California** (32,483 acres), **Oregon** (13,273 acres), and **Michigan** (6,701 acres). Important sweet cherry cultivars include Bing, Ulster, Rainier, Brooks, Tulare, King, and Sweetheart (Wikipedia). In 2017, the total planted bearing acreage was reported by the USDA to be 93,866 acres (Table 1)[1]. Sweet cherry acreage is less than 300,000 per year and qualifies as a minor use crop.

3.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Cherry (Sweet)

3.2.1 Indaziflam use in cherry (sweet) for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest (weed) resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, states of occurrence (California and Oregon), year reported, and herbicide site of action for weeds located in **orchards**, such as sweet cherry orchards, in California and Oregon. California accounts for over 32,000 acres and Oregon 13,000 acres of sweet cherries, roughly one-half of all sweet cherries produced in the United States. The additional listing below for "Herbicide Resistant Weeds in Washington, United States" (~38,000 acres of bearing cherries, sweet) shows that resistance of selected weed species also occurs to most herbicide modes-of-action commonly used in orchards in that state, with the exception of indaziflam.



INTERNATIONAL SURVEY OF HERBICIDE RESISTANT WEEDS

Home | Summaries | Resistant Weeds | Add New Case | Herbicides | Researchers | Literature | Help

Orchards

Select by Group

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Herbicide Poster
Herbicide Classification System

Resistant Weeds

By Site of Action
By Crop
By Species
By Country
By Individual Herbicide

Membership

Drag a column header and drop it here to group by that column

Herbicide Resistant Weeds in Orchards Globally

(click on a column header to sort or click on a species for details)

#	Species	CommonName	Country	FirstYear	Site of Action
1	*Lolium rigidum*	Rigid Ryegrass	United States (California)	1998	EPSP synthase inhibitors (G/9)
2	*Conyza canadensis*	Horseweed	United States (California)	2005	EPSP synthase inhibitors (G/9)
3	*Echinochloa colona*	Junglerice	United States (California)	2008	EPSP synthase inhibitors (G/9)
4	*Lolium perenne ssp. multiflorum*	Italian Ryegrass	United States (California)	2008	EPSP synthase inhibitors (G/9)
5	*Conyza bonariensis*	Hairy Fleabane	United States (California)	2009	**Multiple Resistance: 2 Sites of Action** PSI Electron Diverter (D/22) EPSP synthase inhibitors (G/9)
6	*Lolium perenne ssp. multiflorum*	Italian Ryegrass	United States (California)	2015	Glutamine synthase inhibitors (H/10)
7	*Lolium perenne ssp. multiflorum*	Italian Ryegrass	United States (California)	2015	**Multiple Resistance: 3 Sites of Action** ACCase inhibitors (A/1) PSI Electron Diverter (D/22) EPSP synthase inhibitors (G/9)
8	*Lolium perenne ssp. multiflorum*	Italian Ryegrass	United States (California)	2016	**Multiple Resistance: 4 Sites of Action** ACCase inhibitors (A/1) ALS inhibitors (B/2) PSI Electron Diverter (D/22) EPSP synthase inhibitors (G/9)
9	*Amaranthus palmeri*	Palmer Amaranth	United States (New Mexico)	2007	EPSP synthase inhibitors (G/9)
10	*Lolium perenne ssp. multiflorum*	Italian Ryegrass	United States (Oregon)	2004	EPSP synthase inhibitors (G/9)
11	*Lolium perenne ssp. multiflorum*	Italian Ryegrass	United States (Oregon)	2010	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) Glutamine synthase inhibitors (H/10)

Herbicide Resistant Weeds in Washington, United States.					
#	Year	Species	Site of Action	Actives	Contacts
1	1970	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	simazine	Rick Boydston
2	1987	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron	Donn Thill
3	1988	*Centaurea solstitialis* Yellow Starthistle	Synthetic Auxins (O/4)	picloram	Steven Seefeldt
4	1989	*Kochia scoparia* Kochia	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
5	1991	*Avena fatua* Wild Oat	ACCase inhibitors (A/1)	diclofop-methyl, fenoxaprop-P-ethyl, pinoxaden, quizalofop-P-ethyl, sethoxydim	Steven Seefeldt, Ahmet Uludag
6	1992	*Amaranthus powellii* Powell Amaranth	Photosystem II inhibitors (C1/5)	terbacil	Kassim Al-Khatib, Rick Boydston
7	1993	*Lactuca serriola* Prickly Lettuce	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
8	2000	*Sonchus asper* Spiny Sowthistle	ALS inhibitors (B/2)	imazamox, thifensulfuron-methyl	Kee-Woong Park
9	2007	*Lactuca serriola* Prickly Lettuce	Synthetic Auxins (O/4)	2,4-D, dicamba, MCPA	Ian Burke
10	2010	*Amaranthus retroflexus* Redroot Pigweed	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
11	2010	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
12	2010	*Anthemis cotula* Mayweed Chamomile	ALS inhibitors (B/2)	cloransulam-methyl, imazethapyr, thifensulfuron-methyl, tribenuron-methyl	Alejandro Perez-Jones, Carol Mallory-Smith
13	2015	*Salsola tragus* Russian-thistle	EPSP synthase inhibitors (G/9)	glyphosate	Ian Burke, Prashant Jha, Vipan Kumar, Drew Lyon
14	2018	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Long chain fatty acid inhibitors (K3/15)	flufenacet	Alberto Collavo, Roland Beffa

To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are also currently limited approved herbicides of other modes of activity that are still fully effective for weed control in sweet cherries and other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in California and/or Oregon. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

"As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]

"Overall, indaziflam and oxadiazon provided good (80 to 89%) to excellent control of dna-resistant goosegrass in both years, but dimethenamid and sulfentrazone were inconsistent." – McCullough et. al.[4]

"It is concluded that saflufenacil can be tank mixed with glufosinate for control of broadleaf and grass weeds; however, addition of indaziflam in tank mixture provided long-term, broad-spectrum weed control in Florida citrus compared with other treatments." – Jhala et. al.[5]

"Soil organic matter (SOM) explained the highest proportion of variability in predicting the herbicide dose required for 80% *Kochia* growth reduction (GR80) for flumioxazin and indaziflam (R2 =0.72 and 0.79 respectively)." – Sebastian et.al.[6]

"All three biotypes (of Goosegrass (*Eleusine indica*) Biotypes Resistant to Preemergence-Applied Oxadiazon) were completely controlled by preemergence applied labeled rates of prodiamine and indaziflam. This is the first peer-reviewed report of evolved weed resistance to oxadiazon." – McElroy et. al.[7]

"New herbicide products today tend to be premixed formulations of existing actives with known modes of action, new salts and esters or new actives with minor chemical modifications that claim to improve weed efficacy and spectrum, crop safety, reduced rates and/or soil residual activity. Recent examples of such advancements include the synthetic auxins aminocyclopyrachlor and halauxifen-methyl, the ACCase inhibitor pinoxaden, the PPO inhibitor saflufenacil, the HPPD inhibitors bicyclopyrone, tembotrione and pyrasulfotole, the ALS inhibitor trifamone, the cellulose biosynthesis inhibitor (CBI) indaziflam and very-long-chain fatty acid (VLCFA) inhibitors pyroxasulfone and fenoxasulfone." – Green.[8]

"Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[9]

An accession of *Camelina microcarpa* suspected to be resistant to sulfonylurea herbicides was identified in Oregon in 1998 field experiments. Greenhouse research confirmed that the putative resistant biotype was resistant to chlorsulfuron and metsulfuron on a whole plant level. Compared with the resistant (R) biotype, the susceptible (S) biotype was 1000 and 10,000-fold more sensitive to metsulfuron and chlorsulfuron respectively. The R biotype was also resistant to other sulfonylurea,

sulfonylaminocarbonyl-triazolinone, imidazolinone and triazolopyrimidine herbicides. – Hanson et.al.[10]

3.2.2 Indaziflam use in cherry (sweet) for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of cherry (sweet).

3.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3.] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4.] Efficacy of Preemergence Herbicides for Controlling a Dinitroaniline-Resistant Goosegrass (Eleusine indica) in Georgia. Patrick E. McCullough, Jialin Yu, and Diego G´omez de Barreda. 2013. Weed Technology 27:639–644.

[5.] Tank Mixing Saflufenacil, Glufosinate, and Indaziflam Improved Burndown and Residual Weed Control. Amit J. Jhala, Analiza H. M. Ramirez, and Megh Singh. 2013. Weed Technology 27:422–429

[6.] Influence of soil properties and soil moisture on the efficacy of indaziflam and flumioxazin on *Kocia scoparia* L. D. Sebastian, S. Nissen, P. Westra, D. Shaner, G. Butters. 2017. Pest Manag Sci; 73: 444–451.

[7.] Identification of Goosegrass (Eleusine indica) Biotypes Resistant to Preemergence-Applied Oxadiazon. J. Scott McElroy, William B. Head, Glenn R. Wehtje, and David Spak. 2017. Weed Technology 31:675–681.

[8.] Current state of herbicides in herbicide-resistant crops. Green, J.M. 2014. Pest Manag Sci 2014; 70: 1351–1357.

[9.] Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

[10.] Resistance of Camelina microcarpa to acetolactate synthase inhibiting herbicides. 2004. B. Hanson, K. Park, C Mallory-Smith and D. Thill. Weed Research 44: 187-194.

4.0 Justification of the Need for Indaziflam to Control Key Weeds in Pistachios

4.1 Pistachio Acreage

The USDA National Agricultural Statistics Service indicates pistachios are an important U.S. crop with production exclusively centered in the state of California. In 2017, the U.S acreage for bearing pistachios in California was reported by the USDA to be 247,872 acres (Table 1)[1]. Pistachio acreage is less than 300,000 per year and qualifies as a minor use crop.

4.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Pistachios

4.2.1 The Indaziflam use in pistachios for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest (weed) resistance.*

Status of Herbicide Resistance in California – Brad Hanson : January, 2014

Herbicide resistance in California is currently dominated by two patterns of resistance that differ somewhat from the rest of the United States. The first major category is multiple-resistance in a number of sedge and grass weeds of the rice production region of the Sacramento Valley. Rice in these areas is typically grown under flooded conditions and is often in long-term rice monoculture due to soil and water conditions in the area which makes them heavily reliant on herbicides for weed control. These cases tend to be due to non-target site mechanisms or, in some cases, combinations of target site and non-target site mechanisms of resistance, and present a serious challenge to growers. The second broad category is glyphosate-resistant weeds in orchards, vineyards, and associated non-crop areas such as roadsides, canal banks, and field margins. Glyphosate has been the most important herbicide in these areas for several years due to efficacy, economical cost, and a favorable environmental and toxicological profile. In the past decade, several new cases of glyphosate resistance have been documented. The most widespread of these appears to be hairy fleabane which can be found nearly anywhere in the agricultural areas of the state. One important distinction between California and other regions of the US is that our cases of glyphosate-resistance are not primarily associated with Roundup Ready cropping systems but instead with non-crop uses or directed spray applications in woody perennial crops. Roundup Ready crops (cotton, maize, and recently alfalfa) are grown in California and do have some challenges with glyphosate-resistant weeds; however, tillage and irrigation practices seem to have reduced or delayed this problem in comparison to the reduced tillage row crop systems in other parts of the country.

Herbicide Resistant Weeds in California, United States

#	Year	Species	Site of Action	Actives	Contacts
1	1981	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Jodie Holt
2	1989	*Lolium perenne* Perennial Ryegrass	ALS inhibitors (B/2)	sulfometuron-methyl	Leonard Saari, Josephine Cotterman
3	1993	*Sagittaria montevidensis* California Arrowhead	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
4	1993	*Cyperus difformis* Smallflower Umbrella Sedge	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
5	1994	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron, sulfometuron-methyl	Timothy Prather, Jodie Holt
6	1996	*Avena fatua* Wild Oat	Cell elongation inhibitors (Z/8)	difenzoquat	Steve Orloff, Jodie Holt
7	1997	*Ammannia auriculata* Eared Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
8	1997	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
9	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	ACCase inhibitors (A/1)	fenoxaprop-P-ethyl	Albert Fischer
10	1998	*Lolium rigidum* Rigid Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Thomas Lanini ; retired, Brad Hanson, Marie Jasieniuk
11	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	Lipid inhibitors (N/8)	thiobencarb = benthiocarb	Albert Fischer
12	2000	*Echinochloa oryzoides* Early Watergrass	Lipid inhibitors (N/8)	molinate, thiobencarb = benthiocarb	Albert Fischer
13	2000	*Ammannia coccinea* Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill

14	2000	*Echinochloa crus-galli var. crus-galli* Barnyardgrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid Inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
15	2000	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid Inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
16	2001	*Phalaris minor* Little seed Canary grass	ACCase inhibitors (A/1)	clethodim, fenoxaprop-P-ethyl, fluazifop-P-butyl, sethoxydim	Joseph Di Tomaso
17	2002	*Digitaria ischaemum* Smooth Crabgrass	Synthetic Auxins (O/4)	quinclorac	Albert Fischer
18	2005	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright
19	2007	*Conyza bonariensis* Hairy Fleabane	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Marcelo L. Moretti
20	2008	*Echinochloa colona* Junglerice	EPSP synthase inhibitors (G/9)	glyphosate	Albert Fischer, Thomas Lanini : retired, Brad Hanson, Steve Wright
21	2008	*Lolium perenne ssp. multiflorum* Italian Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Marie Jasieniuk
22	2009	*Conyza bonariensis* Hairy Fleabane	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright, Marcelo L. Moretti
23	2013	*Cyperus difformis* Smallflower Umbrella Sedge	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
24	2013	*Poa annua* Annual Bluegrass	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Marcelo L. Moretti
25	2014	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
26	2014	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Marcelo L. Moretti
27	2015	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Steve Wright, Jorge Angeles, Samikshya Budhathoki , Mala To, Sonia Rios
28	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Glutamine synthase inhibitors (H/10)	glufosinate-ammonium	Marie Jasieniuk, Parsa Tehranchian
29	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 3 Sites of Action** ACCase inhibitors (A/1) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat, sethoxydim	Brad Hanson, Marie Jasieniuk, Caio Brunharo, Parsa Tehranchian
30	2016	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 4 Sites of Action** ACCase inhibitors (A/1) ALS inhibitors (B/2) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	clethodim, cyhalofop-butyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, glyphosate, imazamox, mesosulfuron-methyl, paraquat, sethoxydim	Marie Jasieniuk, Maor Matzrafi, Parsa Tehranchian

The table above shows the herbicide resistant weeds in California listed by weed species, common name, year reported, herbicide site of action and contact. California accounts for 247,872 acres of pistachios, essentially 100% of all pistachios produced in the United States. The table shows that resistance of selected weed species also occurs to most herbicide modes-of-action commonly used in orchards in California, with the exception of indaziflam.

The following comment was also noted as an introduction to this listing by Dr. Brad Hanson, Weed Scientist, UC-Davis, in 2014:

"The second broad category is glyphosate-resistant weeds in orchards, vineyards, and associated non-crop areas such as roadsides, canal banks, and field margins. Glyphosate has been the most important herbicide in these areas for several years due to efficacy, economical cost, and a favorable environmental and toxicological profile. In the past decade, several new cases of glyphosate resistance have been documented. The most widespread of these appears to be hairy fleabane which can be found nearly anywhere in the agricultural areas of the state. One important distinction between California and other regions of the US is that our cases of glyphosate-resistance are not primarily associated with Roundup Ready cropping systems but instead with non-crop uses or directed spray applications in woody perennial crops." – Hanson 2014

To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in pistachios and other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in California. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[3]

4.2.2 Indaziflam use in pistachio for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of pistachio.

4.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3]Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

5.0 Justification of the Need for Indaziflam to Control Key Weeds in Lemons

5.1 Lemon Acreage

The USDA National Agricultural Statistics Service indicates lemons are an important U.S. crop with production in the states of Arizona, California, Florida, Hawaii, Louisiana, and Texas. In 2012 the U.S acreage for bearing lemons was reported by the USDA to be 7,117 acres in Arizona, 51,472 acres in California, 124 acres in Florida, 113 acres in Hawaii, 17 acres in Louisiana, and 148 acres in Texas. The 59,001 bearing acres of lemons reported in 2017 is lower than 300,000 acres per year (Table 1).[1]

5.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Lemons

5.2.1 The Indaziflam use in lemons for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

Herbicide Resistant Weeds in California, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1981	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Jodie Holt
2	1989	*Lolium perenne* Perennial Ryegrass	ALS inhibitors (B/2)	sulfometuron-methyl	Leonard Saari, Josephine Cotterman
3	1993	*Sagittaria montevidensis* California Arrowhead	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
4	1993	*Cyperus difformis* Smallflower Umbrella Sedge	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
5	1994	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron, sulfometuron-methyl	Timothy Prather, Jodie Holt
6	1996	*Avena fatua* Wild Oat	Cell elongation inhibitors (Z/8)	difenzoquat	Steve Orloff, Jodie Holt
7	1997	*Ammannia auriculata* Eared Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
8	1997	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
9	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	ACCase inhibitors (A/1)	fenoxaprop-P-ethyl	Albert Fischer
10	1998	*Lolium rigidum* Rigid Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Thomas Lanini : retired, Brad Hanson, Marie Jasieniuk
11	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	Lipid Inhibitors (N/8)	thiobencarb = benthiocarb	Albert Fischer
12	2000	*Echinochloa oryzoides* Early Watergrass	Lipid Inhibitors (N/8)	molinate, thiobencarb = benthiocarb	Albert Fischer
13	2000	*Ammannia coccinea* Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
14	2000	*Echinochloa crus-galli var. crus-galli* Barnyardgrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid Inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
15	2000	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid Inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
16	2001	*Phalaris minor* Little seed Canary grass	ACCase inhibitors (A/1)	clethodim, fenoxaprop-P-ethyl, fluazifop-P-butyl, sethoxydim	Joseph Di Tomaso

17	2002	*Digitaria ischaemum* Smooth Crabgrass	Synthetic Auxins (O/4)	quinclorac	Albert Fischer
18	2005	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright
19	2007	*Conyza bonariensis* Hairy Fleabane	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Marcelo L. Moretti
20	2008	*Echinochloa colona* Junglerice	EPSP synthase inhibitors (G/9)	glyphosate	Albert Fischer, Thomas Lanini ; retired, Brad Hanson, Steve Wright
21	2008	*Lolium perenne ssp. multiflorum* Italian Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Marie Jasieniuk
22	2009	*Conyza bonariensis* Hairy Fleabane	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright, Marcelo L. Moretti
23	2013	*Cyperus difformis* Smallflower Umbrella Sedge	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
24	2013	*Poa annua* Annual Bluegrass	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Marcelo L. Moretti
25	2014	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
26	2014	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Marcelo L. Moretti
27	2015	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Steve Wright, Jorge Angeles, Samikshya Budhathoki , Mala Yo, Sonia Rios
28	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Glutamine synthase inhibitors (H/10)	glufosinate-ammonium	Marie Jasieniuk, Parsa Tehranchian
29	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 3 Sites of Action** ACCase inhibitors (A/1) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat, sethoxydim	Brad Hanson, Marie Jasieniuk, Caio Brunharo, Parsa Tehranchian
30	2016	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 4 Sites of Action** ACCase inhibitors (A/1) ALS inhibitors (B/2) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	clethodim, cyhalofop-butyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, glyphosate, imazamox, mesosulfuron-methyl, paraquat, sethoxydim	Marie Jasieniuk, Maor Matzrafi, Parsa Tehranchian

The table above, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistance Weeds" [2] shows the herbicide weeds in California listed by weed species, common name, year reported, herbicide site of action and contact. California accounts for 87% of the lemons produced in the United States.
The table also shows that resistance of selected weed species occurs to most herbicide modes-of-action commonly used in California, with the exception of indaziflam.

The following comment was also noted as an introduction to this listing by Dr. Brad Hanson, Weed Scientist, UC-Davis, in 2014:

"The second broad category is glyphosate-resistant weeds in orchards, vineyards, and associated non-crop areas such as roadsides, canal banks, and field margins. Glyphosate has been the most important herbicide in these areas for several years due to efficacy, economical cost, and a favorable environmental and toxicological profile. In the past decade, several new cases of glyphosate resistance have been documented. The most widespread of these

appears to be hairy fleabane which can be found nearly anywhere in the agricultural areas of the state. One important distinction between California and other regions of the US is that our cases of glyphosate-resistance are not primarily associated with Roundup Ready cropping systems but instead with non-crop uses or directed spray applications in woody perennial crops." – Hanson 2014

To date, there have yet to be any reported cases of weed species that have evolved field resistance to CBIs (Cellulose Biosynthesis Inhibitor) such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in lemon orchards and other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in California. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]
>
> "Overall, indaziflam and oxadiazon provided good (80 to 89%) to excellent control of dna-resistant goosegrass in both years, but dimethenamid and sulfentrazone were inconsistent." – McCullough et. al.[4]
>
> "It is concluded that saflufenacil can be tank mixed with glufosinate for control of broadleaf and grass weeds; however, addition of indaziflam in tank mixture provided long-term, broad-spectrum weed control in Florida citrus compared with other treatments." – Jhala et. al.[5]
>
> "Soil organic matter (SOM) explained the highest proportion of variability in predicting the herbicide dose required for 80% *Kochia* growth reduction (GR80) for flumioxazin and indaziflam (R2 =0.72 and 0.79 respectively)." – Sebastian et.al.[6]
>
> "All three biotypes (of Goosegrass (*Eleusine indica*) Biotypes Resistant to Preemergence-Applied Oxadiazon) were completely controlled by preemergence applied labeled rates of prodiamine and indaziflam. This is the first peer-reviewed report of evolved weed resistance to oxadiazon." – McElroy et. al.[7]
>
> "Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides

(Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[8]

5.2.2 Indaziflam use in lemons for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops.

5.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3.] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4.] Efficacy of Preemergence Herbicides for Controlling a Dinitroaniline-Resistant Goosegrass (Eleusine indica) in Georgia. Patrick E. McCullough, Jialin Yu, and Diego G´omez de Barreda. 2013. Weed Technology 27:639–644.

[5] Tank Mixing Saflufenacil, Glufosinate, and Indaziflam Improved Burndown and Residual Weed Control. Amit J. Jhala, Analiza H. M. Ramirez, and Megh Singh. 2013. Weed Technology 27:422–429

[6.] Influence of soil properties and soil moisture on the efficacy of indaziflam and flumioxazin on *Kocia scoparia* L. D. Sebastian, S. Nissen, P. Westra, D. Shaner, G. Butters. 2017. Pest Manag Sci; 73: 444–451.

[7.] Identification of Goosegrass (Eleusine indica) Biotypes Resistant to Preemergence-Applied Oxadiazon. J. Scott McElroy, William B. Head, Glenn R. Wehtje, and David Spak. 2017. Weed Technology 31:675–681.

[8] Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

6.0 Justification of the Need for Indaziflam to Control Key weeds in Pears

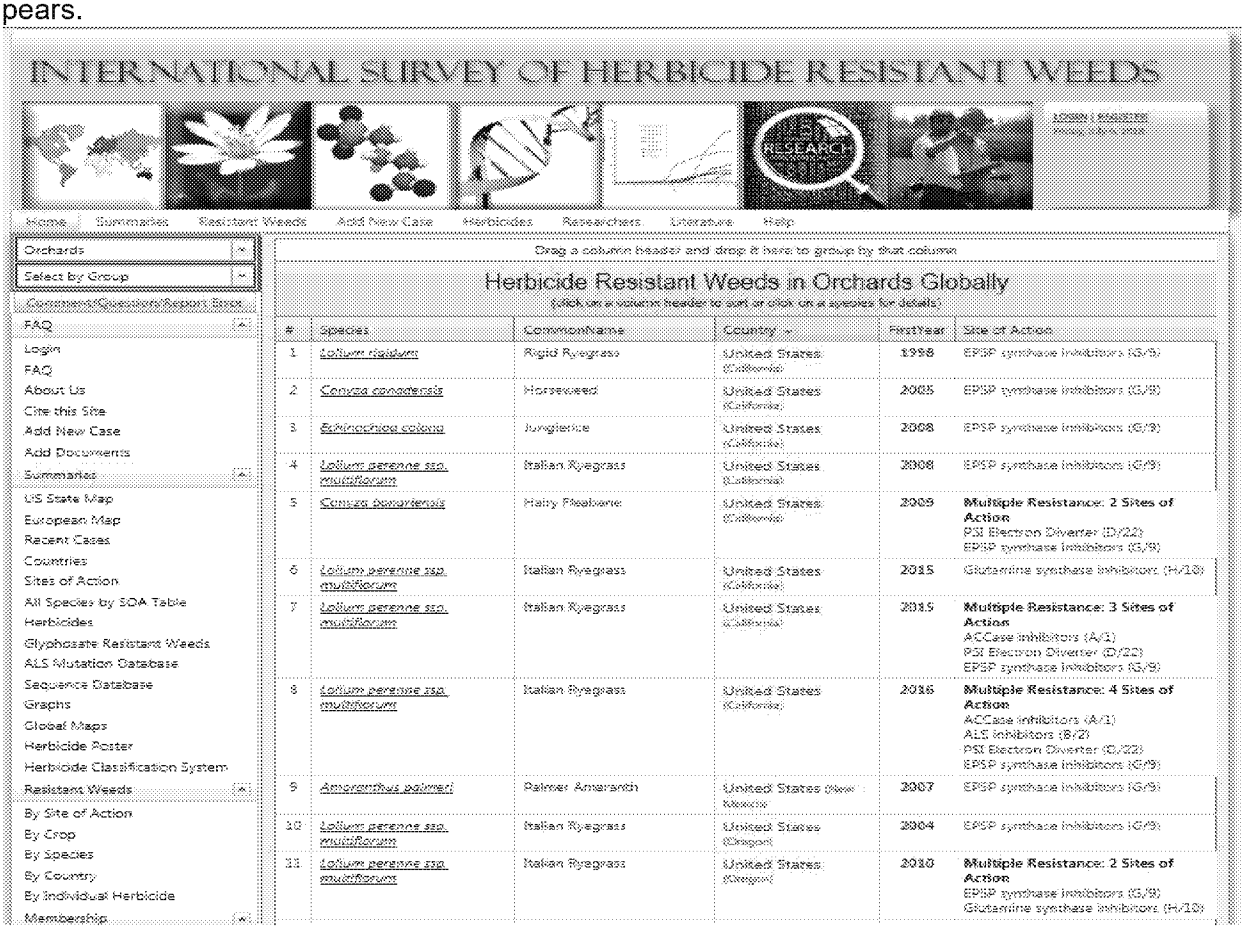
6.1 Pear Acreage

The USDA National Agricultural Statistics Service indicates pears are an important U.S. crop in the states of California, Michigan, New York, Oregon, Pennsylvania, and Washington. In 2015 the U.S acreage for bearing pears was reported by the USDA to be 10,377 acres in California, 584 acres in Michigan, 710 acres in New York, 15,702 acres in Oregon, 757 acres in Pennsylvania, and 20,033 acres in Washington. The total of 51,435 bearing acres of pears reported in 2017 is lower than 300,000 acres per year (Table 1).[1]

6.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Pears

6.2.1 The Indaziflam use in pears for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, states of occurrence (California and Oregon), year reported, and herbicide site of action for weeds located in **orchards**, such as pear orchards, in California and Oregon. California accounts for 10,377 acres and Oregon 15,702 acres of pears.



The additional listing below for “Herbicide Resistant Weeds in Washington, United States” (46,300 acres of bearing pears) shows that resistance of selected weed species also occurs to most herbicide modes-of-action commonly used in orchards in that state, with the exception of indaziflam. The resistant weeds in this list have the potential to develop in Washington pear orchards.

Herbicide Resistant Weeds in Washington, United States.					
#	Year	Species	Site of Action	Actives	Contacts
1	1970	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	simazine	Rick Boydston
2	1987	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron	Donn Thill
3	1988	*Centaurea solstitialis* Yellow Starthistle	Synthetic Auxins (O/4)	picloram	Steven Seefeldt
4	1989	*Kochia scoparia* Kochia	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
5	1991	*Avena fatua* Wild Oat	ACCase inhibitors (A/1)	diclofop-methyl, fenoxaprop-P-ethyl, pinoxaden, quizalofop-P-ethyl, sethoxydim	Steven Seefeldt, Ahmet Uludag
6	1992	*Amaranthus powellii* Powell Amaranth	Photosystem II inhibitors (C1/5)	terbacil	Kassim Al-Khatib, Rick Boydston
7	1993	*Lactuca serriola* Prickly Lettuce	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
8	2000	*Sonchus asper* Spiny Sowthistle	ALS inhibitors (B/2)	imazamox, thifensulfuron-methyl	Kee-Woong Park
9	2007	*Lactuca serriola* Prickly Lettuce	Synthetic Auxins (O/4)	2,4-D, dicamba, MCPA	Ian Burke
10	2010	*Amaranthus retroflexus* Redroot Pigweed	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
11	2010	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
12	2010	*Anthemis cotula* Mayweed Chamomile	ALS inhibitors (B/2)	cloransulam-methyl, imazethapyr, thifensulfuron-methyl, tribenuron-methyl	Alejandro Perez-Jones, Carol Mallory-Smith
13	2015	*Salsola tragus* Russian-thistle	EPSP synthase inhibitors (G/9)	glyphosate	Ian Burke, Prashant Jha, Vipan Kumar, Drew Lyon
14	2018	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Long chain fatty acid inhibitors (K3/15)	flufenacet	Alberto Collavo, Roland Beffa

The tables below show the herbicide resistant weeds found in New York, Pennsylvania and Michigan. Since herbicides with the modes of action shown in the list are commonly used in pear orchards, the resistant weeds have the potential to develop in pear orchards.

Herbicide Resistant Weeds in New York, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1977	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	atrazine, cyanazine, simazine	Russell Hahn
2	1980	*Amaranthus hybridus (syn: quitensis)* Smooth Pigweed	Photosystem II inhibitors (C1/5)	atrazine, metribuzin, simazine	Russell Hahn
3	1991	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine, simazine	Russell Hahn
4	1993	*Ambrosia artemisiifolia* Common Ragweed	Photosystem II inhibitors (C1/5)	atrazine, cyanazine, simazine	Russell Hahn

Herbicide Resistant Weeds in Pennsylvania, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1980	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	atrazine	William Curran
2	1980	*Amaranthus hybridus (syn: quitensis)* Smooth Pigweed	Photosystem II inhibitors (C1/5)	atrazine	William Curran
3	1998	*Amaranthus retroflexus* Redroot Pigweed	**Multiple Resistance: 2 Sites of Action** ALS inhibitors (B/2) Photosystem II inhibitors (C1/5)	atrazine, chlorimuron-ethyl, cloransulam-methyl, imazamox, imazaquin, imazethapyr, primisulfuron-methyl, thifensulfuron-methyl	William Curran, Dwight Lingenfelter
4	2001	*Sorghum bicolor* Shattercane	ALS inhibitors (B/2)	imazamox, imazethapyr, nicosulfuron, oxasulfuron, primisulfuron-methyl	William Curran
5	2003	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	William Curran
6	2004	*Setaria faberi* Giant Foxtail	ALS inhibitors (B/2)	foramsulfuron, imazamox, nicosulfuron	William Curran
7	2008	*Ambrosia artemisiifolia* Common Ragweed	EPSP synthase inhibitors (G/9)	glyphosate	William Curran, Dwight Lingenfelter
8	2010	*Stellaria media* Common Chickweed	ALS inhibitors (B/2)	pyroxsulam, thifensulfuron-methyl, tribenuron-methyl	William Curran
9	2013	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	William Curran, Dwight Lingenfelter

Herbicide Resistant Weeds in Michigan, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1975	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	atrazine, metribuzin, simazine	James Kells, Chad Lee, Steven Gower
2	1990	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Donald Penner, Steven Gower
3	1990	*Ambrosia artemisiifolia* Common Ragweed	Photosystem II inhibitors (C1/5)	atrazine	Donald Penner, Steven Gower
4	1991	*Portulaca oleracea* Common Purslane	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, linuron	Bernard Zandstra, Joseph G. Masabni, Steven Gower
5	1993	*Daucus carota* Wild Carrot	Synthetic Auxins (O/4)	2,4-D	James Kells, Jeff Stachler
6	1998	*Ambrosia artemisiifolia* Common Ragweed	ALS inhibitors (B/2)	cloransulam-methyl, imazamox, imazethapyr	Paul Schmitzer, Steven Gower
7	2000	*Amaranthus tuberculatus (=A. rudis)* Tall Waterhemp	ALS inhibitors (B/2)	chlorimuron-ethyl, imazethapyr, thifensulfuron-methyl	Steven Gower
8	2001	*Amaranthus powellii* Powell Amaranth	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, diuron	Steven Gower
9	2001	*Amaranthus retroflexus* Redroot Pigweed	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, diuron	Steven Gower
10	2001	*Polygonum persicaria* Ladysthumb	Photosystem II inhibitors (C1/5)	atrazine, simazine	Steven Gower
11	2001	*Chenopodium album* Common Lambsquarters	ALS inhibitors (B/2)	imazamox, thifensulfuron-methyl	Donald Penner, Steven Gower
12	2002	*Amaranthus hybridus (syn: quitensis)* Smooth Pigweed	ALS inhibitors (B/2)	chlorimuron-ethyl, imazamox, thifensulfuron-methyl	Steven Gower
13	2002	*Conyza canadensis* Horseweed	ALS inhibitors (B/2)	chlorimuron-ethyl, cloransulam-methyl	Steven Gower
14	2002	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, diuron, simazine	Steven Gower
15	2002	*Conyza canadensis* Horseweed	PSII inhibitor (Ureas and amides) (C2/7)	diuron	Steven Gower
16	2003	*Atriplex patula* Halberdleaf Orach	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower
17	2004	*Solanum ptycanthum* Eastern Black Nightshade	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower

18	2004	*Chenopodium album var. striatum (=C. strictum var. glaucophyllum)* Lateflowering Goosefoot	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower
19	2004	*Abutilon theophrasti* Velvetleaf	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower
20	2005	*Kochia scoparia* Kochia	ALS inhibitors (B/2)	imazamox, triflusulfuron-methyl	Steven Gower
21	2006	*Setaria faberi* Giant Foxtail	ALS inhibitors (B/2)	foramsulfuron, imazethapyr, nicosulfuron	Steven Gower
22	2007	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Steven Gower
23	2011	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Christy Sprague
24	2012	*Amaranthus blitoides* Prostrate Pigweed	Photosystem II inhibitors (C1/5)	terbacil	Bernard Zandstra, Rick Boydston
25	2016	*Ambrosia artemisiifolia* Common Ragweed	**Multiple Resistance: 2 Sites of Action** ALS inhibitors (B/2) PPO inhibitors (E/14)	cloransulam-methyl, fomesafen	Erin Hill

To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in pears and other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in the states where pears are grown. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]

> "Overall, indaziflam and oxadiazon provided good (80 to 89%) to excellent control of dna-resistant goosegrass in both years, but dimethenamid and sulfentrazone were inconsistent." – McCullough et. al.[4]

> "It is concluded that saflufenacil can be tank mixed with glufosinate for control of broadleaf and grass weeds; however, addition of indaziflam in tank mixture provided long-term, broad-spectrum weed control in Florida citrus compared with other treatments." – Jhala et. al.[5]

"Soil organic matter (SOM) explained the highest proportion of variability in predicting the herbicide dose required for 80% *Kochia* growth reduction (GR80) for flumioxazin and indaziflam (R2 =0.72 and 0.79 respectively)." – Sebastian et.al.[6]

"All three biotypes (of Goosegrass (*Eleusine indica*) Biotypes Resistant to Preemergence-Applied Oxadiazon) were completely controlled by preemergence applied labeled rates of prodiamine and indaziflam. This is the first peer-reviewed report of evolved weed resistance to oxadiazon." – McElroy et. al.[7]

"New herbicide products today tend to be premixed formulations of existing actives with known modes of action, new salts and esters or new actives with minor chemical modifications that claim to improve weed efficacy and spectrum, crop safety, reduced rates and/or soil residual activity. Recent examples of such advancements include the synthetic auxins aminocylcopyrachlor and halauxifen-methyl, the ACCase inhibitor pinoxaden, the PPO inhibitor saflufenacil, the HPPD inhibitors bicyclopyrone, tembotrione and pyrasulfotole, the ALS inhibitor trifamone, the cellulose biosynthesis inhibitor (CBI) indaziflam and very-long-chain fatty acid (VLCFA) inhibitors pyroxasulfone and fenoxasulfone." – Green.[8]

"Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[9]

An accession of *Camelina microcarpa* suspected to be resistant to sulfonylurea herbicides was identified in Oregon in 1998 field experiments. Greenhouse research confirmed that the putative resistant biotype was resistant to chlorsulfuron and metsulfuron on a whole plant level. Compared with the resistant (R) biotype, the susceptible (S) biotype was 1000 and 10,000-fold more sensitive to metsulfuron and chlorsulfuron respectively. The R biotype was also resistant to other sulfonylurea, sulfonylaminocarbonyl-triazolinone, imidazolinone and triazolopyrimidine herbicides. – Hanson et.al.[10]

6.2.2 Indaziflam use in pears for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on

their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of pears.

6.3 References

[1] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4] Efficacy of Preemergence Herbicides for Controlling a Dinitroaniline-Resistant Goosegrass (Eleusine indica) in Georgia. Patrick E. McCullough, Jialin Yu, and Diego G´omez de Barreda. 2013. Weed Technology 27:639–644.

[5] Tank Mixing Saflufenacil, Glufosinate, and Indaziflam Improved Burndown and Residual Weed Control. Amit J. Jhala, Analiza H. M. Ramirez, and Megh Singh. 2013. Weed Technology 27:422–429

[6] Influence of soil properties and soil moisture on the efficacy of indaziflam and flumioxazin on *Kocia scoparia* L. D. Sebastian, S. Nissen, P. Westra, D. Shaner, G. Butters. 2017. Pest Manag Sci; 73: 444–451.

[7] Identification of Goosegrass (Eleusine indica) Biotypes Resistant to Preemergence-Applied Oxadiazon. J. Scott McElroy, William B. Head, Glenn R. Wehtje, and David Spak. 2017. Weed Technology 31:675–681.

[8] Current state of herbicides in herbicide-resistant crops. Green, J.M. 2014. Pest Manag Sci 2014; 70: 1351–1357.

[9] Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

[10] Resistance of Camelina microcarpa to acetolactate synthase inhibiting herbicides. 2004. B. Hanson, K. Park, C Mallory-Smith and D. Thill. Weed Research 44: 187-194.

7.0 Justification of the Need for Indaziflam to Control Key Weeds in Olives

7.1 Olive Acreage

The USDA National Agricultural Statistics Service indicates olives are an important U.S. crop with production almost exclusively centered in the state of California. In 2017 the U.S acreage for bearing olives was reported by the USDA to be 40,915 acres (39,563 in California) which is lower than 300,000 acres per year (Table 1).[1]

7.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Olives

7.2.1 The Indaziflam use in olives for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below shows the herbicide resistant weeds in California listed by weed species, common name, year reported, herbicide site of action and contact. California accounts for 39,563 acres of olives, essentially 97% of all olives produced in the United States. The table shows that resistance of selected weed species also occurs to most herbicide modes-of-action commonly used in orchards in California, with the exception of indaziflam.

The following comment was also noted as an introduction to this listing by Dr. Brad Hanson, Weed Scientist, UC-Davis, in 2014:

"The second broad category is glyphosate-resistant weeds in orchards, vineyards, and associated non-crop areas such as roadsides, canal banks, and field margins. Glyphosate has been the most important herbicide in these areas for several years due to efficacy, economical cost, and a favorable environmental and toxicological profile. In the past decade, several new cases of glyphosate resistance have been documented. The most widespread of these appears to be hairy fleabane which can be found nearly anywhere in the agricultural areas of the state. One important distinction between California and other regions of the US is that our cases of glyphosate-resistance are not primarily associated with Roundup Ready cropping systems but instead with non-crop uses or directed spray applications in woody perennial crops." – Hanson 2014

Status of Herbicide Resistance in California - Brad Hanson : January, 2014

Herbicide resistance in California is currently dominated by two patterns of resistance that differ somewhat from the rest of the United States. The first major category is multiple-resistance in a number of sedge and grass weeds of the rice production region of the Sacramento Valley. Rice in these areas is typically grown under flooded conditions and is often in long-term rice monoculture due to soil and water conditions in the area which makes them heavily reliant on herbicides for weed control. These cases tend to be due to non-target site mechanisms or, in some cases, combinations of target site and non-target site mechanisms of resistance, and present a serious challenge to growers. The second broad category is glyphosate-resistant weeds in orchards, vineyards, and associated non-crop areas such as roadsides, canal banks, and field margins. Glyphosate has been the most important herbicide in these areas for several years due to efficacy, economical cost, and a favorable environmental and toxicological profile. In the past decade, several new cases of glyphosate resistance have been documented. The most widespread of these appears to be hairy fleabane which can be found nearly anywhere in the agricultural areas of the state. One important distinction between California and other regions of the US is that our cases of glyphosate-resistance are not primarily associated with Roundup Ready cropping systems but instead with non-crop uses or directed spray applications in woody perennial crops. Roundup Ready crops (cotton, maize, and recently alfalfa) are grown in California and do have some challenges with glyphosate-resistant weeds; however, tillage and irrigation practices seem to have reduced or delayed this problem in comparison to the reduced tillage row crop systems in other parts of the country.

Herbicide Resistant Weeds in California, United States

#	Year	Species	Site of Action	Actives	Contacts
1	1981	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Jodie Holt
2	1989	*Lolium perenne* Perennial Ryegrass	ALS inhibitors (B/2)	sulfometuron-methyl	Leonard Saari, Josephine Cotterman
3	1993	*Sagittaria montevidensis* California Arrowhead	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
4	1993	*Cyperus difformis* Smallflower Umbrella Sedge	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
5	1994	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron, sulfometuron-methyl	Timothy Prather, Jodie Holt
6	1996	*Avena fatua* Wild Oat	Cell elongation inhibitors (Z/8)	diflenzoquat	Steve Orloff, Jodie Holt
7	1997	*Ammannia auriculata* Eared Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
8	1997	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
9	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	ACCase inhibitors (A/1)	fenoxaprop-P-ethyl	Albert Fischer
10	1998	*Lolium rigidum* Rigid Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Thomas Lanini : retired, Brad Hanson, Marie Jasieniuk
11	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	Lipid inhibitors (N/8)	thiobencarb = benthiocarb	Albert Fischer
12	2000	*Echinochloa oryzoides* Early Watergrass	Lipid inhibitors (N/8)	molinate, thiobencarb = benthiocarb	Albert Fischer
13	2000	*Ammannia coccinea* Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill

14	2000	*Echinochloa crus-galli var. crus-galli* Barnyardgrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
15	2000	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
16	2001	*Phalaris minor* Little seed Canary grass	ACCase inhibitors (A/1)	clethodim, fenoxaprop-P-ethyl, fluazifop-P-butyl, sethoxydim	Joseph Di Tomaso
17	2002	*Digitaria ischaemum* Smooth Crabgrass	Synthetic Auxins (O/4)	quinclorac	Albert Fischer
18	2005	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright
19	2007	*Conyza bonariensis* Hairy Fleabane	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Marcelo L. Moretti
20	2008	*Echinochloa colona* Junglerice	EPSP synthase inhibitors (G/9)	glyphosate	Albert Fischer, Thomas Lanini : retired, Brad Hanson, Steve Wright
21	2008	*Lolium perenne ssp. multiflorum* Italian Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Marie Jasieniuk
22	2009	*Conyza bonariensis* Hairy Fleabane	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright, Marcelo L. Moretti
23	2013	*Cyperus difformis* Smallflower Umbrella Sedge	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
24	2013	*Poa annua* Annual Bluegrass	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Marcelo L. Moretti
25	2014	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
26	2014	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Marcelo L. Moretti
27	2015	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Steve Wright, Jorge Angeles, Samikshya Budhathoki , Maia To, Sonia Rios
28	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Glutamine synthase inhibitors (H/10)	glufosinate-ammonium	Marie Jasieniuk, Parsa Tehranchian
29	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 3 Sites of Action** ACCase inhibitors (A/1) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat, sethoxydim	Brad Hanson, Marie Jasieniuk, Caio Brunharo, Parsa Tehranchian
30	2016	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 4 Sites of Action** ACCase inhibitors (A/1) ALS inhibitors (B/2) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	clethodim, cyhalofop-butyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, glyphosate, imazamox, mesosulfuron-methyl, paraquat, sethoxydim	Marie Jasieniuk, Maor Matzrafi, Parsa Tehranchian

To date, there have yet to be any reported cases of weed species that have evolved field resistance to CBIs such as indaziflam[2]. There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in olives and

other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in California. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[3]

7.2.2 Indaziflam use in olives for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of olives.

7.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3]Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 200

8.0 Justification of the Need for Indaziflam to Control Key Weeds in Highbush Blueberry

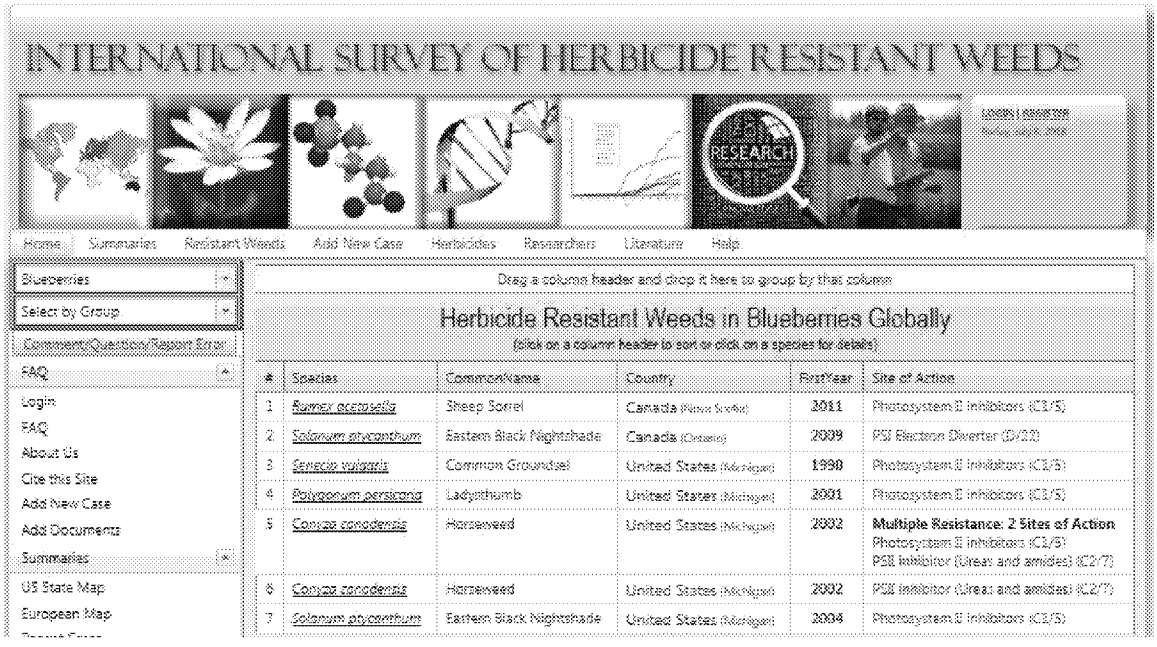
8.1 Highbush Blueberry Acreage

Highbush blueberries (also referred to as "tame" blueberries) are grown in a number of states such as Florida with 5,903 acres, Georgia with 15,680 acres, Michigan with 20,180 acres, New Jersey with 8,229 acres, and North Carolina with 8,424 acres harvested in 2017. In 2017, USDA NASS reports 97,515 bearing acres for highbush blueberry, which is lower than 300,000 acres per year (Table 1).[1]

8.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Highbush Blueberry

8.2.1 The Indaziflam use in highbush blueberry for the control of existing herbicide resistant weeds satisfies *Criterion III. The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, states of occurrence (Michigan), year reported, and herbicide site of action for weeds of blueberries.



To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in blueberry for Common groundsel (*Senecio vulgaris*) and horseweed (*Conyza canadensis*) that is resistant to photosystem II inhibitors (herbicide mode of activity group C1/5). These weed species are commonly found within and adjacent to blueberry fields in Michigan. These and other resistant weeds are also found in other states where blueberries are grown. Indaziflam is commonly applied in tank mixtures and/or rotations with other herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

The comments below come from peer reviewed scientific publication noting the development of herbicide resistance in their publication on herbicide resistance development in red sorrel which is related to sheep sorrel in blueberry fields:

> "It is concluded that red sorrel is hexazinone-resistant in some wild blueberry fields. A portion of the psbA gene was sequenced and it was determined that resistant plants had a Phe to Val substitution at position 255 in the D1 protein. This is the first recorded instance of hexazinone resistance in a perennial broadleaf weed in blueberry fields." – Li et al.3

Conversely, recent publications support the lack of known resistance to indaziflam in field applications:

> "As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[4]

8.2.2 Indaziflam use in blueberries for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of blueberries.

8.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3.] Li, Z., Boyd, N., McLean, N., & Rutherford, K. (2014). Hexazinone Resistance in Red Sorrel (Rumex acetosella). Weed Science, 62(3), 532-537. doi:10.1614/WS-D-13-00173.1

[4.] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

9.0 Justification of the Need for Indaziflam to Control Key Weeds in Raspberry

9.1 Raspberry Acreage

Raspberries (red and black) are grown in a number of states but the main production areas include California with 5,761 acres harvested, Oregon with 2,548 acres, and Washington with 9,034 acres harvested in 2017. In 2017, USDA NASS reports 20,646 harvested acres for raspberries which is lower than 300,000 acres per year (Table 1).[1]

9.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Raspberry

9.2.1 The Indaziflam use in raspberry for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, states of occurrence (Washington and California), year reported, and herbicide site of action. In 2017 the State of Washington accounted for 44% and California accounted for 28% of all raspberry production in the United States.

Herbicide Resistant Weeds in Washington, United States

#	Year	Species	Site of Action	Actives	Contacts
1	1970	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	simazine	Rick Boydston
2	1987	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron	Donn Thill
3	1988	*Centaurea solstitialis* Yellow Starthistle	Synthetic Auxins (O/4)	picloram	Steven Seefeldt
4	1989	*Kochia scoparia* Kochia	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
5	1993	*Avena fatua* Wild Oat	ACCase inhibitors (A/1)	diclofop-methyl, fenoxaprop-P-ethyl, pinoxaden, quizalofop-P-ethyl, sethoxydim	Steven Seefeldt, Ahmet Uludag
6	1992	*Amaranthus powellii* Powell Amaranth	Photosystem II inhibitors (C1/5)	terbacil	Kassim Al-Khatib, Rick Boydston
7	1998	*Lactuca serriola* Prickly Lettuce	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
8	2000	*Sonchus oleer* Spiny Sowthistle	ALS inhibitors (B/2)	imazamox, thifensulfuron-methyl	Kee-Woong Park
9	2007	*Lactuca serriola* Prickly Lettuce	Synthetic Auxins (O/4)	2,4-D, dicamba, MCPA	Ian Burke
10	2010	*Amaranthus retroflexus* Redroot Pigweed	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
11	2010	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
12	2010	*Anthemis cotula* Mayweed Chamomile	ALS inhibitors (B/2)	cloransulam-methyl, imazethapyr, thifensulfuron-methyl, tribenuron-methyl	Alejandro Perez-Jones, Carol Mallory-Smith
13	2015	*Salsola tragus* Russian-thistle	EPSP synthase inhibitors (G/9)	glyphosate	Ian Burke, Prashant Jha, Vipan Kumar

Status of Herbicide Resistance in California - Brad Hanson : January, 2014

Herbicide resistance in California is currently dominated by two patterns of resistance that differ somewhat from the rest of the United States. The first major category is multiple-resistance in a number of sedge and grass weeds of the rice production region of the Sacramento Valley. Rice in these areas is typically grown under flooded conditions and is often in long-term rice monoculture due to soil and water conditions in the area which makes them heavily reliant on herbicides for weed control. These cases tend to be due to non-target site mechanisms or, in some cases, combinations of target site and non-target site mechanisms of resistance, and present a serious challenge to growers. The second broad category is glyphosate-resistant weeds in orchards, vineyards, and associated non-crop areas such as roadsides, canal banks, and field margins. Glyphosate has been the most important herbicide in these areas for several years due to efficacy, economical cost and a favorable environmental and toxicological profile. In the past decade, several new cases of glyphosate resistance have been documented. The most widespread of these appears to be hairy fleabane which can be found nearly anywhere in the agricultural areas of the state. One important distinction between California and other regions of the US is that our cases of glyphosate-resistance are not primarily associated with Roundup Ready cropping systems but instead with non-crop uses or directed spray applications in woody perennial crops. Roundup Ready crops (cotton, maize, and recently alfalfa) are grown in California and do have some challenges with glyphosate-resistant weeds; however, tillage and irrigation practices seem to have reduced or delayed this problem in comparison to the reduced tillage row crop systems in other parts of the country.

Herbicide Resistant Weeds in California, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1981	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Jodie Holt
2	1989	*Lolium perenne* Perennial Ryegrass	ALS inhibitors (B/2)	sulfometuron-methyl	Leonard Saari, Josephine Cotterman
3	1993	*Sagittaria montevidensis* California Arrowhead	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
4	1993	*Cyperus difformis* Smallflower Umbrella Sedge	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
5	1994	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron, sulfometuron-methyl	Timothy Prather, Jodie Holt
6	1996	*Avena fatua* Wild Oat	Cell elongation inhibitors (Z/8)	difenzoquat	Steve Orloff, Jodie Holt
7	1997	*Ammannia auriculata* Eared Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
8	1997	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
9	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	ACCase inhibitors (A/1)	fenoxaprop-P-ethyl	Albert Fischer
10	1998	*Lolium rigidum* Rigid Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Thomas Lanini : retired, Brad Hanson, Marie Jasieniuk
11	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	Lipid inhibitors (N/8)	thiobencarb = benthiocarb	Albert Fischer
12	2000	*Echinochloa oryzoides* Early Watergrass	Lipid inhibitors (N/8)	molinate, thiobencarb = benthiocarb	Albert Fischer
13	2000	*Ammannia coccinea* Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill

14	2000	*Echinochloa crus-galli var. crus-galli* Barnyardgrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
15	2000	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
16	2001	*Phalaris minor* Little seed Canary grass	ACCase inhibitors (A/1)	clethodim, fenoxaprop-P-ethyl, fluazifop-P-butyl, sethoxydim	Joseph Di Tomaso
17	2002	*Digitaria ischaemum* Smooth Crabgrass	Synthetic Auxins (O/4)	quinclorac	Albert Fischer
18	2005	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright
19	2007	*Conyza bonariensis* Hairy Fleabane	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Marcelo L. Moretti
20	2008	*Echinochloa colona* Junglerice	EPSP synthase inhibitors (G/9)	glyphosate	Albert Fischer, Thomas Lanini : retired, Brad Hanson, Steve Wright
21	2008	*Lolium perenne ssp. multiflorum* Italian Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Marie Jasieniuk
22	2009	*Conyza bonariensis* Hairy Fleabane	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright, Marcelo L. Moretti
23	2013	*Cyperus difformis* Smallflower Umbrella Sedge	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
24	2013	*Poa annua* Annual Bluegrass	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Marcelo L. Moretti
25	2014	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
26	2014	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Marcelo L. Moretti
27	2015	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Steve Wright, Jorge Angeles, Samikshya Budhathoki , Mala To, Sonia Rios
28	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Glutamine synthase inhibitors (H/10)	glufosinate-ammonium	Marie Jasieniuk, Parsa Tehranchian
29	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 3 Sites of Action** ACCase inhibitors (A/1) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat, sethoxydim	Brad Hanson, Marie Jasieniuk, Caio Brunharo, Parsa Tehranchian
30	2016	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 4 Sites of Action** ACCase inhibitors (A/1) ALS inhibitors (B/2) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	clethodim, cyhalofop-butyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, glyphosate, imazamox, mesosulfuron-methyl, paraquat, sethoxydim	Marie Jasieniuk, Maor Matzrafi, Parsa Tehranchian

To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in raspberries and other cane crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to cane berry production in Washington and California. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]

> "New herbicide products today tend to be premixed formulations of existing actives with known modes of action, new salts and esters or new actives with minor chemical modifications that claim to improve weed efficacy and spectrum, crop safety, reduced rates and/or soil residual activity. Recent examples of such advancements include the synthetic auxins aminocylcopyrachlor and halauxifen-methyl, the ACCase inhibitor pinoxaden, the PPO inhibitor saflufenacil, the HPPD inhibitors bicyclopyrone, tembotrione and pyrasulfotole, the ALS inhibitor trifamone, the cellulose biosynthesis inhibitor (CBI) indaziflam and very-long-chain fatty acid (VLCFA) inhibitors pyroxasulfone and fenoxasulfone." – Green.[4]

> "Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[5]

9.2.2 Indaziflam use in raspberries for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on

their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of raspberries.

9.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3.] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4.] Current state of herbicides in herbicide-resistant crops. Green, J.M. 2014. Pest Manag Sci 2014; 70: 1351–1357.

[5.] Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

10.0 Justification of the Need for Indaziflam to Control Key Weeds in Hops

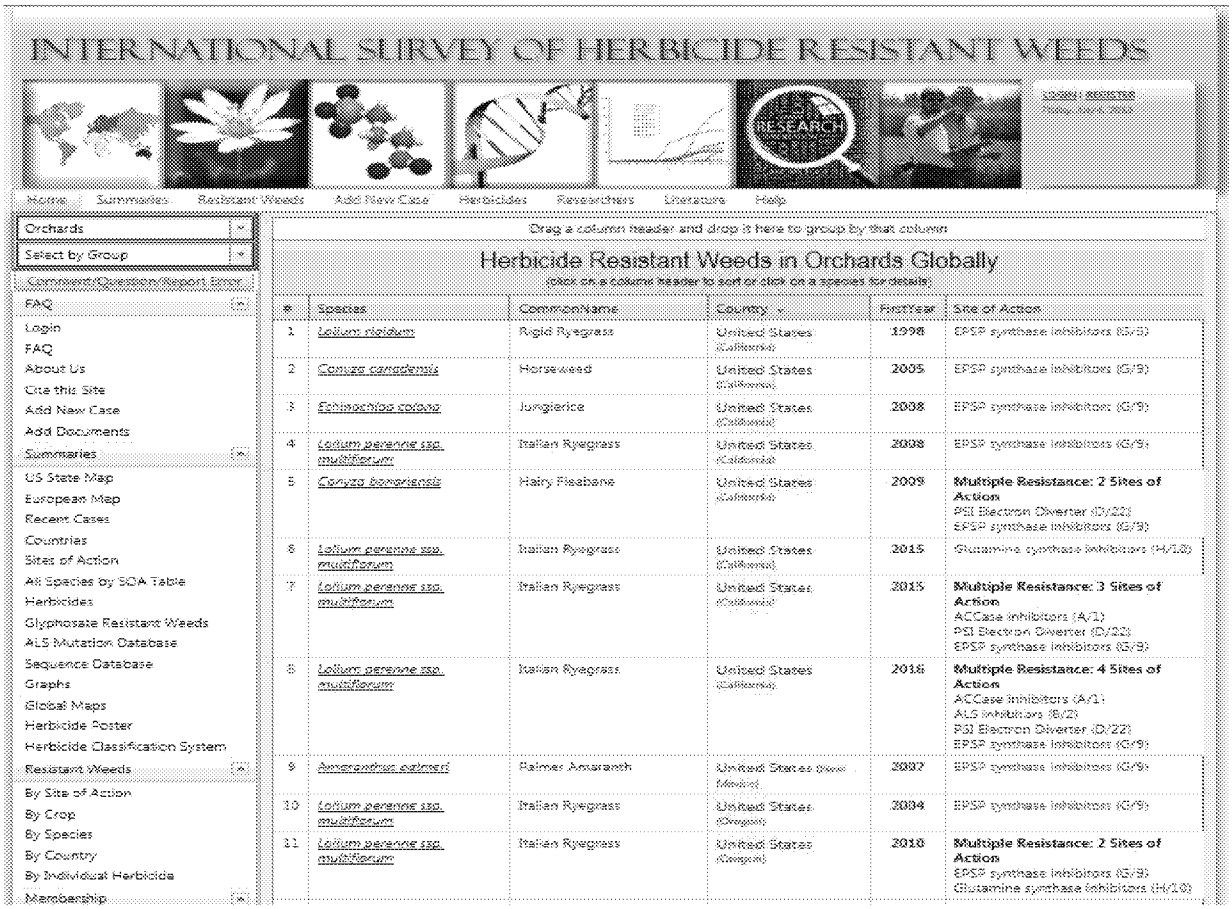
10.1 Hops Acreage

Hops are principally grown in Idaho with 9,641 acres harvested, Oregon with 8,292 acres, and Washington with 38,679 acres harvested in 2017. In 2017 USDA NASS reports 59,429 harvested acres of hops in the US which is lower than 300,000 acres per year (Table 1).[1]

10.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Hops

10.2.1 The Indaziflam use in hops for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, states of occurrence, year reported, and herbicide site of action for weeds located in **orchards**, such as hops. The additional listing below for "Herbicide Resistant Weeds in Washington, United States" (38,679 acres of hops) shows that resistance of selected weed species also occurs to most herbicide modes-of-action commonly used in orchards in that state, with the exception of indaziflam.



Herbicide Resistant Weeds in Washington, United States					
#	Year	Species	Site of Action	Actives	Contacts
1	1970	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	simazine	Rick Boydston
2	1987	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron	Donn Thill
3	1988	*Centaurea solstitialis* Yellow Starthistle	Synthetic Auxins (O/4)	picloram	Steven Seefeldt
4	1989	*Kochia scoparia* Kochia	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
5	1991	*Avena fatua* Wild Oat	ACCase inhibitors (A/1)	diclofop-methyl, fenoxaprop-P-ethyl, pinoxaden, quizalofop-P-ethyl, sethoxydim	Steven Seefeldt, Ahmet Uludag
6	1992	*Amaranthus powellii* Powell Amaranth	Photosystem II inhibitors (C1/5)	terbacil	Kassim Al-Khatib, Rick Boydston
7	1993	*Lactuca serriola* Prickly Lettuce	ALS inhibitors (B/2)	chlorsulfuron	Steven Seefeldt
8	2000	*Sonchus asper* Spiny Sowthistle	ALS inhibitors (B/2)	imazamox, thifensulfuron-methyl	Kee-Woong Park
9	2007	*Lactuca serriola* Prickly Lettuce	Synthetic Auxins (O/4)	2,4-D, dicamba, MCPA	Ian Burke
10	2010	*Amaranthus retroflexus* Redroot Pigweed	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
11	2010	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	metribuzin, terbacil	Rick Boydston
12	2010	*Anthemis cotula* Mayweed Chamomile	ALS inhibitors (B/2)	diflufenzopyr-sodium, imazethapyr, thifensulfuron-methyl, tribenuron-methyl	Alejandro Perez-Jones, Carol Mallory-Smith
13	2015	*Salsola tragus* Russian-thistle	EPSP synthase inhibitors (G/9)	glyphosate	Ian Burke, Prashant Jha, Vipan Kumar, Drew Lyon
14	2018	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Long chain fatty acid inhibitors (K3/15)	flufenacet	Alberto Collavo, Roland Beffa

To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in hops and other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]
>
> "Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[4]

10.2.2 Indaziflam use in hops for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of hops.

10.3 References

1. United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

2. Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

3. Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

5. Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

11.0 Justification of the Need for Indaziflam to Control Key Weeds in Coffee

11.1 Coffee Acreage

USDA NASS reports 8,441 bearing acres of coffee grown in the US, mostly in Hawaii in 2017. Coffee production is lower than 300,000 acres per year (Table 1).[1]

11.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Coffee

11.2.1 The Indaziflam use in coffee for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, state of occurrence (Hawaii), year reported, and herbicide site of action. Hawaii accounts for 7,200 acres of coffee, which is the vast majority of all production in the United States (anecdotal reports of very small acreage of coffee grown in California exist – see: https://www.saveur.com/california-coffee-growing).

Herbicide Resistant Weeds in Hawaii, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1957	*Commelina diffusa* Spreading Dayflower	Synthetic Auxins (O/4)	2,4-D	
2	1987	*Chloris barbata = (C. inflata)* Swollen Fingergrass	Photosystem II inhibitors (C1/5)	ametryn	Lance Santo
3	1987	*Chloris barbata = (C. inflata)* Swollen Fingergrass	PSII inhibitor (Ureas and amides) (C2/7)	diuron	Lance Santo
4	2003	*Eleusine indica* Goosegrass	Photosystem II inhibitors (C1/5)	metribuzin	James Brosnan

Contributing Weed Scientists

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To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in coffee for goosegrass (*elusine indica*) that is resistant to metribuzin (herbicide mode of activity group C1/5 – photosystem II inhibitors). This weed species is commonly found within and

adjacent to orchards, vineyards and citrus groves in Hawaii. Indaziflam is commonly applied in tank mixtures and/or rotations with other herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]
>
> "Overall, indaziflam and oxadiazon provided good (80 to 89%) to excellent control of dna-resistant goosegrass in both years, but dimethenamid and sulfentrazone were inconsistent." – McCullough et. al.[4]
>
> "It is concluded that saflufenacil can be tank mixed with glufosinate for control of broadleaf and grass weeds; however, addition of indaziflam in tank mixture provided long-term, broad-spectrum weed control in Florida citrus compared with other treatments." – Jhala et. al.[5]
>
> "Soil organic matter (SOM) explained the highest proportion of variability in predicting the herbicide dose required for 80% *Kochia* growth reduction (GR80) for flumioxazin and indaziflam (R2 =0.72 and 0.79 respectively)." – Sebastian et.al.[6]
>
> "All three biotypes (of Goosegrass (*Eleusine indica*) Biotypes Resistant to Preemergence-Applied Oxadiazon) were completely controlled by preemergence applied labeled rates of prodiamine and indaziflam. This is the first peer-reviewed report of evolved weed resistance to oxadiazon." – McElroy et. al.[7]
>
> "New herbicide products today tend to be premixed formulations of existing actives with known modes of action, new salts and esters or new actives with minor chemical modifications that claim to improve weed efficacy and spectrum, crop safety, reduced rates and/or soil residual activity. Recent examples of such advancements include the synthetic auxins aminocylcopyrachlor and halauxifen-methyl, the ACCase inhibitor pinoxaden, the PPO inhibitor saflufenacil, the HPPD inhibitors bicyclopyrone, tembotrione and pyrasulfotole, the ALS inhibitor trifamone, the cellulose biosynthesis inhibitor (CBI) indaziflam and very-long-chain fatty acid (VLCFA) inhibitors pyroxasulfone and fenoxasulfone." – Green.[8]
>
> "In 2003, two goosegrass biotypes on the island of Kauai, Hawaii were found to be resistant to applications of metribuzin plus MSMA. Metribuzin plus MSMA applied at rates of 0.28 kg ai/ha plus 2.2 kg/ha, respectively, followed by MSMA at 2.2 kg/ha 7 d later, provided 100% control of two susceptible goosegrass biotypes, but no control of two resistant biotypes…. The two biotypes that were resistant to metribuzin plus MSMA were also resistant to applications of simazine plus MSMA."[9]

11.2.2 Indaziflam use in coffee for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of coffee.

11.3 References

[1] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4] Efficacy of Preemergence Herbicides for Controlling a Dinitroaniline-Resistant Goosegrass (Eleusine indica) in Georgia. Patrick E. McCullough, Jialin Yu, and Diego G´omez de Barreda. 2013. Weed Technology 27:639–644.

[5] Tank Mixing Saflufenacil, Glufosinate, and Indaziflam Improved Burndown and Residual Weed Control. Amit J. Jhala, Analiza H. M. Ramirez, and Megh Singh. 2013. Weed Technology 27:422–429

[6] Influence of soil properties and soil moisture on the efficacy of indaziflam and flumioxazin on *Kocia scoparia* L. D. Sebastian, S. Nissen, P. Westra, D. Shaner, G. Butters. 2017. Pest Manag Sci; 73: 444–451.

[7] Identification of Goosegrass (Eleusine indica) Biotypes Resistant to Preemergence-Applied Oxadiazon. J. Scott McElroy, William B. Head, Glenn R. Wehtje, and David Spak. 2017. Weed Technology 31:675–681.

[8] Current state of herbicides in herbicide-resistant crops. Green, J.M. 2014. Pest Manag Sci 2014; 70: 1351–1357.

[9] Metribuzin-Resistant Goosegrass (Eleusine indica) in Bermudagrass Turf,James T. Brosnan, Roy K. Nishimoto, and Joseph DeFrank. Weed Technology 22(4), 675-678, (1 October 2008)

12.0 Justification of the Need for Indaziflam to Control Key Weeds in Limes

12.1 Lime Acreage

The USDA National Agricultural Statistics Service indicates limes are an important U.S. crop with production in the states of California, Florida, Hawaii, and Texas. In 2017, the U.S acreage for bearing limes was reported by the USDA to be 816 acres in California, 59 acres in Florida, 114 acres in Hawaii, and 50 acres in Texas. The total of 1,051 bearing acres of limes reported in 2017 is lower than 300,000 acres per year (Table 1).[1]

12.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Limes

12.2.1 The Indaziflam use in limes for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

Herbicide Resistant Weeds in California, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1981	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Jodie Holt
2	1989	*Lolium perenne* Perennial Ryegrass	ALS inhibitors (B/2)	sulfometuron-methyl	Leonard Saari, Josephine Cotterman
3	1993	*Sagittaria montevidensis* California Arrowhead	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
4	1993	*Cyperus difformis* Smallflower Umbrella Sedge	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
5	1994	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron, sulfometuron-methyl	Timothy Prather, Jodie Holt
6	1996	*Avena fatua* Wild Oat	Cell elongation inhibitors (Z/8)	difenzoquat	Steve Orloff, Jodie Holt
7	1997	*Ammannia auriculata* Eared Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
8	1997	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
9	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	ACCase inhibitors (A/1)	fenoxaprop-P-ethyl	Albert Fischer
10	1998	*Lolium rigidum* Rigid Ryegrass	EPSP synthase inhibitors (G/8)	glyphosate	Thomas Lanini ; retired, Brad Hanson, Marie Jasieniuk
11	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	Lipid inhibitors (N/8)	thiobencarb = benthiocarb	Albert Fischer
12	2000	*Echinochloa oryzoides* Early Watergrass	Lipid inhibitors (N/8)	molinate, thiobencarb = benthiocarb	Albert Fischer
13	2000	*Ammannia coccinea* Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
14	2000	*Echinochloa crus-galli var. crus-galli* Barnyardgrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
15	2000	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
16	2001	*Phalaris minor* Little seed Canary grass	ACCase inhibitors (A/1)	clethodim, fenoxaprop-P-ethyl, fluazifop-P-butyl, sethoxydim	Joseph Di Tomaso

17	2002	*Digitaria ischaemum* Smooth Crabgrass	Synthetic Auxins (O/4)	quinclorac	Albert Fischer
18	2005	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright
19	2007	*Conyza bonariensis* Hairy Fleabane	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Marcelo L. Moretti
20	2008	*Echinochloa colona* Junglerice	EPSP synthase inhibitors (G/9)	glyphosate	Albert Fischer, Thomas Lanini : retired, Brad Hanson, Steve Wright
21	2008	*Lolium perenne ssp. multiflorum* Italian Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Marie Jasieniuk
22	2009	*Conyza bonariensis* Hairy Fleabane	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright, Marcelo L. Moretti
23	2013	*Cyperus difformis* Smallflower Umbrella Sedge	PSII Inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
24	2013	*Poa annua* Annual Bluegrass	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Marcelo L. Moretti
25	2014	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	PSII Inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
26	2014	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Marcelo L. Moretti
27	2015	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Steve Wright, Jorge Angeles, Samikshya Budhathoki , Mala To, Sonia Rios
28	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Glutamine synthase inhibitors (H/10)	glufosinate-ammonium	Marie Jasieniuk, Parsa Tehranchian
29	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 3 Sites of Action** ACCase inhibitors (A/1) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat, sethoxydim	Brad Hanson, Marie Jasieniuk, Caio Brunharo, Parsa Tehranchian
30	2016	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 4 Sites of Action** ACCase inhibitors (A/1) ALS inhibitors (B/2) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	clethodim, cyhalofop-butyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, glyphosate, imazamox, mesosulfuron-methyl, paraquat, sethoxydim	Marie Jasieniuk, Maor Matzrafi, Parsa Tehranchian

The table above, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistance Weeds" [2] shows the herbicide weeds in California listed by weed species, common name, year reported, herbicide site of action and contact. California accounts for 77% of the limes produced in the United States.

The table also shows that resistance of selected weed species occurs to most herbicide modes-of-action commonly used in California, with the exception of indaziflam.

The following comment was also noted as an introduction to this listing by Dr. Brad Hanson, Weed Scientist, UC-Davis, in 2014:

"The second broad category is glyphosate-resistant weeds in orchards, vineyards, and associated non-crop areas such as roadsides, canal banks, and field margins. Glyphosate has

been the most important herbicide in these areas for several years due to efficacy, economical cost, and a favorable environmental and toxicological profile. In the past decade, several new cases of glyphosate resistance have been documented. The most widespread of these appears to be hairy fleabane which can be found nearly anywhere in the agricultural areas of the state. One important distinction between California and other regions of the US is that our cases of glyphosate-resistance are not primarily associated with Roundup Ready cropping systems but instead with non-crop uses or directed spray applications in woody perennial crops." – Hanson 2014

To date, there have yet to be any reported cases of weed species that have evolved field resistance to CBIs (Cellulose Biosynthesis Inhibitor) such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in lemon orchards and other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in California. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

> "As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]
>
> "Overall, indaziflam and oxadiazon provided good (80 to 89%) to excellent control of dna-resistant goosegrass in both years, but dimethenamid and sulfentrazone were inconsistent." – McCullough et. al.[4]
>
> "It is concluded that saflufenacil can be tank mixed with glufosinate for control of broadleaf and grass weeds; however, addition of indaziflam in tank mixture provided long-term, broad-spectrum weed control in Florida citrus compared with other treatments." – Jhala et. al.[5]
>
> "Soil organic matter (SOM) explained the highest proportion of variability in predicting the herbicide dose required for 80% *Kochia* growth reduction (GR80) for flumioxazin and indaziflam (R2 =0.72 and 0.79 respectively)." – Sebastian et.al.[6]
>
> "All three biotypes (of Goosegrass (*Eleusine indica*) Biotypes Resistant to Preemergence-Applied Oxadiazon) were completely controlled by preemergence applied labeled rates of prodiamine and indaziflam. This is the first peer-reviewed report of evolved weed resistance to oxadiazon." – McElroy et. al.[7]
>
> "New herbicide products today tend to be premixed formulations of existing actives with known modes of action, new salts and esters or new actives with minor chemical modifications that claim to improve weed efficacy and spectrum, crop safety, reduced rates and/or soil residual activity. Recent examples of such advancements include the

synthetic auxins aminocyclopyrachlor and halauxifen-methyl, the ACCase inhibitor pinoxaden, the PPO inhibitor saflufenacil, the HPPD inhibitors bicyclopyrone, tembotrione and pyrasulfotole, the ALS inhibitor trifamone, the cellulose biosynthesis inhibitor (CBI) indaziflam and very-long-chain fatty acid (VLCFA) inhibitors pyroxasulfone and fenoxasulfone." – Green.[8]

"Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[9]

12.2.2 Indaziflam use in limes for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops.

12.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3.] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4.] Efficacy of Preemergence Herbicides for Controlling a Dinitroaniline-Resistant Goosegrass (Eleusine indica) in Georgia. Patrick E. McCullough, Jialin Yu, and Diego G´omez de Barreda. 2013. Weed Technology 27:639–644.

[5] Tank Mixing Saflufenacil, Glufosinate, and Indaziflam Improved Burndown and

Residual Weed Control. Amit J. Jhala, Analiza H. M. Ramirez, and Megh Singh. 2013. Weed Technology 27:422–429

[6] Influence of soil properties and soil moisture on the efficacy of indaziflam and flumioxazin on *Kocia scoparia* L. D. Sebastian, S. Nissen, P. Westra, D. Shaner, G. Butters. 2017. Pest Manag Sci; 73: 444–451.

[7] Identification of Goosegrass (Eleusine indica) Biotypes Resistant to Preemergence-Applied Oxadiazon. J. Scott McElroy, William B. Head, Glenn R. Wehtje, and David Spak. 2017. Weed Technology 31:675–681.

[8] Current state of herbicides in herbicide-resistant crops. Green, J.M. 2014. Pest Manag Sci 2014; 70: 1351–1357.

[9] Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

13.0 Justification of the Need for Indaziflam to Control Key Weeds in Tart Cherry

13.1 Tart Cherry Acreage

Tart cherries are an important commercial U.S. crop. Most tart cherries are grown in the states of Michigan (26,084 bearing acres), New York (1,564 bearing acres), Oregon (645 bearing acres), Pennsylvania (503 bearing acres), Utah (3,267 bearing acres), Washington (1,765 bearing acres), and Wisconsin (1,552 bearing acres). In 2017, the total planted bearing acreage was reported by the USDA to be 35,944 acres, which is less than 300,000 per year and qualifies as a minor use crop (Table 1).[1]

13.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Tart Cherry

13.2.1 The Indaziflam use in tart cherry for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, states of occurrence (Michigan), year reported, and herbicide site of action for weeds located in **orchards**, such as tart cherry orchards, in Michigan. Michigan accounts for 27,300 acres, roughly three-quarters of all tart cherries produced in the United States.

Herbicide Resistant Weeds in Orchard Globally
(click on a column header to sort or click on a species for details)

#	Species	CommonName	Country	FirstYear	Site of Action
Country: United States					
11	*Chenopodium album*	Common Lambsquarters	United States (Michigan)	1975	Photosystem II inhibitors (C1/5)
12	*Ambrosia artemisiifolia*	Common Ragweed	United States (Michigan)	1990	Photosystem II inhibitors (C1/5)
13	*Senecio vulgaris*	Common Groundsel	United States (Michigan)	1990	Photosystem II inhibitors (C1/5)
14	*Ambrosia artemisiifolia*	Common Ragweed	United States (Michigan)	1998	ALS inhibitors (B/2)
15	*Amaranthus powellii*	Powell Amaranth	United States (Michigan)	2001	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)
16	*Polygonum persicaria*	Ladysthumb	United States (Michigan)	2001	Photosystem II inhibitors (C1/5)
17	*Conyza canadensis*	Horseweed	United States (Michigan)	2002	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)
18	*Conyza canadensis*	Horseweed	United States (Michigan)	2002	PSII inhibitor (Ureas and amides) (C2/7)
19	*Abutilon theophrasti*	Velvetleaf	United States (Michigan)	2004	Photosystem II inhibitors (C1/5)
20	*Solanum ptycanthum*	Eastern Black Nightshade	United States (Michigan)	2004	Photosystem II inhibitors (C1/5)
21	*Conyza canadensis*	Horseweed	United States (Michigan)	2007	EPSP synthase inhibitors (G/9)

To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in tart cherries and other orchard crops in Michigan due to resistance verified for Horseweed, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Powell Amaranth to atrazine and diuron (groups C1/5, C2/7, respectively) and in Horseweed to commonly used herbicides such as glyphosate, atrazine, simazine and diuron (groups G/9, C1/5, C1/5, and C2/7, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in Michigan. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

Herbicide Resistant Weeds in Michigan, United States.

#	Year	Species	Site of Action	Actives	Contacts
1	1975	*Chenopodium album* Common Lambsquarters	Photosystem II inhibitors (C1/5)	atrazine, metribuzin, simazine	James Kells, Chad Lee, Steven Gower
2	1990	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Donald Penner, Steven Gower
3	1990	*Ambrosia artemisiifolia* Common Ragweed	Photosystem II inhibitors (C1/5)	atrazine	Donald Penner, Steven Gower
4	1991	*Portulaca oleracea* Common Purslane	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, linuron	Bernard Zandstra, Joseph G. Masabni, Steven Gower
5	1993	*Daucus carota* Wild Carrot	Synthetic Auxins (O/4)	2,4-D	James Kells, Jeff Stachler
6	1998	*Ambrosia artemisiifolia* Common Ragweed	ALS inhibitors (B/2)	cloransulam-methyl, imazamox, imazethapyr	Paul Schmitzer, Steven Gower
7	2000	*Amaranthus tuberculatus (=A. rudis)* Tall Waterhemp	ALS inhibitors (B/2)	chlorimuron-ethyl, imazethapyr, thifensulfuron-methyl	Steven Gower
8	2001	*Amaranthus powellii* Powell Amaranth	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, diuron	Steven Gower
9	2001	*Amaranthus retroflexus* Redroot Pigweed	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, diuron	Steven Gower
10	2001	*Polygonum persicaria* Ladysthumb	Photosystem II inhibitors (C1/5)	atrazine, simazine	Steven Gower
11	2001	*Chenopodium album* Common Lambsquarters	ALS inhibitors (B/2)	imazamox, thifensulfuron-methyl	Donald Penner, Steven Gower

12	2002	*Amaranthus hybridus (syn: quitensis)* Smooth Pigweed	ALS inhibitors (B/2)	chlorimuron-ethyl, imazamox, thifensulfuron-methyl	Steven Gower
13	2002	*Conyza canadensis* Horseweed	ALS inhibitors (B/2)	chlorimuron-ethyl, cloransulam-methyl	Steven Gower
14	2002	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** Photosystem II inhibitors (C1/5) PSII inhibitor (Ureas and amides) (C2/7)	atrazine, diuron, simazine	Steven Gower
15	2002	*Conyza canadensis* Horseweed	PSII inhibitor (Ureas and amides) (C2/7)	diuron	Steven Gower
16	2003	*Atriplex patula* Halberdleaf Orach	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower
17	2004	*Solanum ptycanthum* Eastern Black Nightshade	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower
18	2004	*Chenopodium album var. striatum (=C. strictum var. glaucophyllum)* Lateflowering Goosefoot	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower
19	2004	*Abutilon theophrasti* Velvetleaf	Photosystem II inhibitors (C1/5)	atrazine	Steven Gower
20	2005	*Kochia scoparia* Kochia	ALS inhibitors (B/2)	imazamox, triflusulfuron-methyl	Steven Gower
21	2006	*Setaria faberi* Giant Foxtail	ALS inhibitors (B/2)	foramsulfuron, imazethapyr, nicosulfuron	Steven Gower
22	2007	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Steven Gower
23	2011	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Christy Sprague
24	2012	*Amaranthus blitoides* Prostrate Pigweed	Photosystem II inhibitors (C1/5)	terbacil	Bernard Zandstra, Rick Boydston
25	2016	*Ambrosia artemisiifolia* Common Ragweed	**Multiple Resistance: 2 Sites of Action** ALS inhibitors (B/2) PPO inhibitors (E/14)	cloransulam-methyl, fomesafen	Erin Hill

"As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]

"Overall, indaziflam and oxadiazon provided good (80 to 89%) to excellent control of dna-resistant goosegrass in both years, but dimethenamid and sulfentrazone were inconsistent." – McCullough et. al.[4]

"It is concluded that saflufenacil can be tank mixed with glufosinate for control of broadleaf and grass weeds; however, addition of indaziflam in tank mixture provided long-term, broad-spectrum weed control in Florida citrus compared with other treatments." – Jhala et. al.[5]

"Soil organic matter (SOM) explained the highest proportion of variability in predicting the herbicide dose required for 80% *Kochia* growth reduction (GR80) for flumioxazin and indaziflam (R2 =0.72 and 0.79 respectively)." – Sebastian et.al.[6]

"All three biotypes (of Goosegrass (*Eleusine indica*) Biotypes Resistant to Preemergence-Applied Oxadiazon) were completely controlled by preemergence applied labeled rates of prodiamine and indaziflam. This is the first peer-reviewed report of evolved weed resistance to oxadiazon." – McElroy et. al.[7]

"New herbicide products today tend to be premixed formulations of existing actives with known modes of action, new salts and esters or new actives with minor chemical modifications that claim to improve weed efficacy and spectrum, crop safety, reduced rates and/or soil residual activity. Recent examples of such advancements include the synthetic auxins aminocyclopyrachlor and halauxifen-methyl, the ACCase inhibitor pinoxaden, the PPO inhibitor saflufenacil, the HPPD inhibitors bicyclopyrone, tembotrione and pyrasulfotole, the ALS inhibitor trifamone, the cellulose biosynthesis inhibitor (CBI) indaziflam and very-long-chain fatty acid (VLCFA) inhibitors pyroxasulfone and fenoxasulfone." – Green.[8]

"Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[9]

An accession of *Camelina microcarpa* suspected to be resistant to sulfonylurea herbicides was identified in Oregon in 1998 field experiments. Greenhouse research confirmed that the putative resistant biotype was resistant to chlorsulfuron and metsulfuron on a whole plant level. Compared with the resistant (R) biotype, the susceptible (S) biotype was 1000 and 10,000-fold more sensitive to metsulfuron and chlorsulfuron respectively. The R biotype was also resistant to other sulfonylurea, sulfonylaminocarbonyl-triazolinone, imidazolinone and triazolopyrimidine herbicides. – Hanson et.al.[10]

13.2.2 Indaziflam use in tart cherry for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers.

An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of tart cherry.

13.3 References

[1.] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2.] Heap I (2014) The international survey of herbicide resistant weeds. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3.] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4.] Efficacy of Preemergence Herbicides for Controlling a Dinitroaniline-Resistant Goosegrass (Eleusine indica) in Georgia. Patrick E. McCullough, Jialin Yu, and Diego G´omez de Barreda. 2013. Weed Technology 27:639–644.

[5.] Tank Mixing Saflufenacil, Glufosinate, and Indaziflam Improved Burndown and Residual Weed Control. Amit J. Jhala, Analiza H. M. Ramirez, and Megh Singh. 2013. Weed Technology 27:422–429

[6.] Influence of soil properties and soil moisture on the efficacy of indaziflam and flumioxazin on *Kocia scoparia* L. D. Sebastian, S. Nissen, P. Westra, D. Shaner, G. Butters. 2017. Pest Manag Sci; 73: 444–451.

[7.] Identification of Goosegrass (Eleusine indica) Biotypes Resistant to Preemergence-Applied Oxadiazon. J. Scott McElroy, William B. Head, Glenn R. Wehtje, and David Spak. 2017. Weed Technology 31:675–681.

[8.] Current state of herbicides in herbicide-resistant crops. Green, J.M. 2014. Pest Manag Sci 2014; 70: 1351–1357.

[9.] Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

[10.] Resistance of Camelina microcarpa to acetolactate synthase inhibiting herbicides. 2004. B. Hanson, K. Park, C Mallory-Smith and D. Thill. Weed Research 44: 187-194.

14.0 Justification of the Need for Indaziflam to Control Key Weeds in Apricots

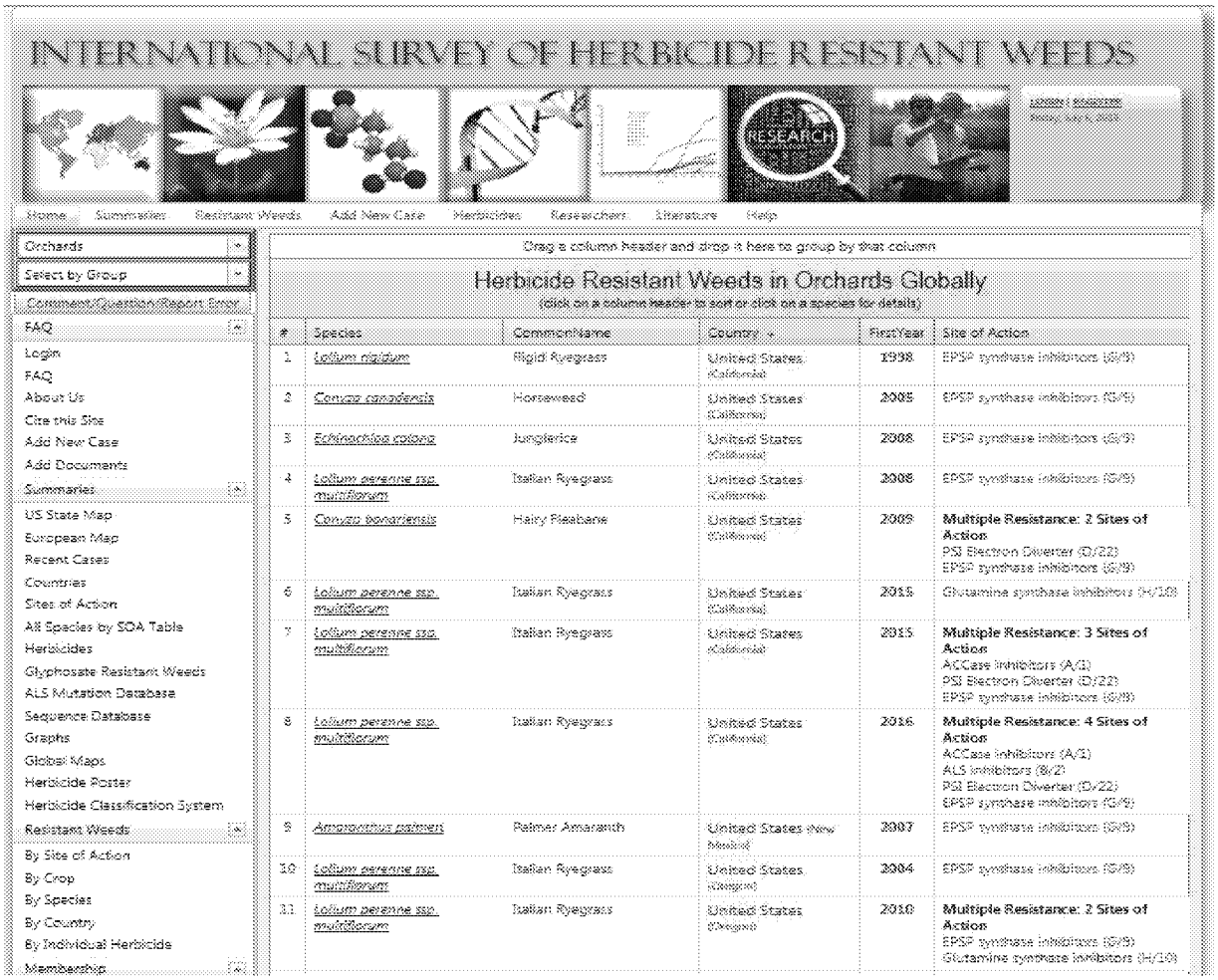
14.1 Apricot Acreage

Apricots are an important commercial U.S. crop with most apricots grown in **California** (10,532 bearing acres). In 2017 the total planted bearing acreage of apricots was reported by the USDA to be 12,179 acres, which is less than 300,000 per year and qualifies as a minor use crop (Table 1).[1]

14.2 Exclusive Use Data Protection Criteria Indaziflam Satisfies in Apricots

14.2.1 The Indaziflam use in apricots for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion III: The minor use pesticide plays or will play a significant part in managing pest resistance.*

The table below, copied from the Weed Science Society of America (WSSA) website for "International Survey of Herbicide Resistant Weeds"[2] shows the listings for the United States of weed species, common name, states of occurrence (California), year reported, and herbicide site of action for weeds located in **orchards**, such as apricot orchards, in California. California accounts for 10,500 acres, nearly 86% of all apricots produced in the United States.



The additional listings below for “Herbicide Resistant Weeds in California, United States” shows that resistance of selected weed species also occurs to most herbicide modes-of-action commonly used in orchards in that state, with the exception of indaziflam.

Herbicide Resistant Weeds in California, United States.					
#	Year	Species	Site of Action	Actives	Contacts
1	1981	*Senecio vulgaris* Common Groundsel	Photosystem II inhibitors (C1/5)	atrazine	Jodie Holt
2	1989	*Lolium perenne* Perennial Ryegrass	ALS inhibitors (B/2)	sulfometuron-methyl	Leonard Saari, Josephine Cotterman
3	1993	*Sagittaria montevidensis* California Arrowhead	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
4	1993	*Cyperus difformis* Smallflower Umbrella Sedge	ALS inhibitors (B/2)	bensulfuron-methyl	Michael Carriere
5	1994	*Salsola tragus* Russian-thistle	ALS inhibitors (B/2)	chlorsulfuron, sulfometuron-methyl	Timothy Prather, Jodie Holt
6	1996	*Avena fatua* Wild Oat	Cell elongation inhibitors (Z/8)	difenzoquat	Steve Orloff, Jodie Holt
7	1997	*Ammannia auriculata* Eared Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
8	1997	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
9	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	ACCase inhibitors (A/1)	fenoxaprop-P-ethyl	Albert Fischer
10	1998	*Lolium rigidum* Rigid Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Thomas Lanini : retired, Brad Hanson, Marie Jasieniuk
11	1998	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	Lipid inhibitors (N/8)	thiobencarb = benthiocarb	Albert Fischer
12	2000	*Echinochloa oryzoides* Early Watergrass	Lipid inhibitors (N/8)	molinate, thiobencarb = benthiocarb	Albert Fischer
13	2000	*Ammannia coccinea* Redstem	ALS inhibitors (B/2)	bensulfuron-methyl	Jim Hill
14	2000	*Echinochloa crus-galli var. crus-galli* Barnyardgrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
15	2000	*Echinochloa phyllopogon (=E. oryzicola)* Late Watergrass	**Multiple Resistance: 2 Sites of Action** ACCase inhibitors (A/1) Lipid inhibitors (N/8)	cyhalofop-butyl, fenoxaprop-P-ethyl, molinate, thiobencarb = benthiocarb	Albert Fischer
16	2001	*Phalaris minor* Little seed Canary grass	ACCase inhibitors (A/1)	clethodim, fenoxaprop-P-ethyl, fluazifop-P-butyl, sethoxydim	Joseph Di Tomaso
17	2002	*Digitaria ischaemum* Smooth Crabgrass	Synthetic Auxins (O/4)	quinclorac	Albert Fischer
18	2005	*Conyza canadensis* Horseweed	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright
19	2007	*Conyza bonariensis* Hairy Fleabane	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Kurt Hembree, Marcelo L. Moretti

20	2008	*Echinochloa colona* Junglerice	EPSP synthase inhibitors (G/9)	glyphosate	Albert Fischer, Thomas Lanini : retired, Brad Hanson, Steve Wright
21	2008	*Lolium perenne ssp. multiflorum* Italian Ryegrass	EPSP synthase inhibitors (G/9)	glyphosate	Marie Jasieniuk
22	2009	*Conyza bonariensis* Hairy Fleabane	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Anil Shrestha, Kurt Hembree, Steve Wright, Marcelo L. Moretti
23	2013	*Cyperus difformis* Smallflower Umbrella Sedge	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
24	2013	*Poa annua* Annual Bluegrass	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Marcelo L. Moretti
25	2014	*Schoenoplectus mucronatus (=Scirpus mucronatus)* Ricefield Bulrush	PSII inhibitor (Ureas and amides) (C2/7)	propanil	Albert Fischer, Rafael Pedroso
26	2014	*Conyza canadensis* Horseweed	**Multiple Resistance: 2 Sites of Action** EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat	Brad Hanson, Marcelo L. Moretti
27	2015	*Amaranthus palmeri* Palmer Amaranth	EPSP synthase inhibitors (G/9)	glyphosate	Brad Hanson, Anil Shrestha, Steve Wright, Jorge Angeles, Samikshya Budhathoki , Mala To, Sonia Rios
28	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	Glutamine synthase inhibitors (H/10)	glufosinate-ammonium	Marie Jasieniuk, Parsa Tehranchian
29	2015	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 3 Sites of Action** ACCase inhibitors (A/1) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	glyphosate, paraquat, sethoxydim	Brad Hanson, Marie Jasieniuk, Caio Brunharo, Parsa Tehranchian
30	2016	*Lolium perenne ssp. multiflorum* Italian Ryegrass	**Multiple Resistance: 4 Sites of Action** ACCase inhibitors (A/1) ALS inhibitors (B/2) EPSP synthase inhibitors (G/9) PSI Electron Diverter (D/22)	clethodim, cyhalofop-butyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, glyphosate, imazamox, mesosulfuron-methyl, paraquat, sethoxydim	Marie Jasieniuk, Maor Matzrafi, Parsa Tehranchian

To date, there have yet to be any reported cases of weed species that have evolved field resistance to group 29 CBIs such as indaziflam.[2] There are currently, however, limited approved herbicides of other modes of activity that are still fully effective for weed control in sweet cherries and other orchard crops due to resistance verified for Rigid Ryegrass, Horseweed, Junglerice, and Amaranth species to glyphosate (herbicide mode of activity group G/9). In addition, multiple herbicide resistance has been recorded by WSSA in Hairy Fleabane to glyphosate and paraquat (groups G/9, D/22, respectively) and in Italian Ryegrass to commonly used herbicides such as glyphosate, sethoxydim, paraquat, rimsulfuron, and glufosinate (groups G/9, A/1, D/22, B/2, and H/10, respectively). All these weed species are commonly found within and adjacent to orchards, vineyards and citrus groves in California and/or Oregon. Indaziflam is commonly applied in tank mixtures and/or rotations with all of the above listed herbicides, or in conjunction with alternate cultural practices to help improve weed control efficacy and prevent the development and spread of resistant weed populations.

"As a CBI, for which there is little evidence of evolved weed resistance, indaziflam represents an important addition to the action mechanisms available for weed management". – Brabham et. al.[3]

"Overall, indaziflam and oxadiazon provided good (80 to 89%) to excellent control of dna-resistant goosegrass in both years, but dimethenamid and sulfentrazone were inconsistent." – McCullough et. al.[4]

"It is concluded that saflufenacil can be tank mixed with glufosinate for control of broadleaf and grass weeds; however, addition of indaziflam in tank mixture provided long-term, broad-spectrum weed control in Florida citrus compared with other treatments." – Jhala et. al.[5]

"Soil organic matter (SOM) explained the highest proportion of variability in predicting the herbicide dose required for 80% *Kochia* growth reduction (GR80) for flumioxazin and indaziflam (R2 =0.72 and 0.79 respectively)." – Sebastian et.al.[6]

"All three biotypes (of Goosegrass (*Eleusine indica*) Biotypes Resistant to Preemergence-Applied Oxadiazon) were completely controlled by preemergence applied labeled rates of prodiamine and indaziflam. This is the first peer-reviewed report of evolved weed resistance to oxadiazon." – McElroy et. al.[7]

"New herbicide products today tend to be premixed formulations of existing actives with known modes of action, new salts and esters or new actives with minor chemical modifications that claim to improve weed efficacy and spectrum, crop safety, reduced rates and/or soil residual activity. Recent examples of such advancements include the synthetic auxins aminocyclopyrachlor and halauxifen-methyl, the ACCase inhibitor pinoxaden, the PPO inhibitor saflufenacil, the HPPD inhibitors bicyclopyrone, tembotrione and pyrasulfotole, the ALS inhibitor trifamone, the cellulose biosynthesis inhibitor (CBI) indaziflam and very-long-chain fatty acid (VLCFA) inhibitors pyroxasulfone and fenoxasulfone." – Green.[8]

"Glyphosate is considered the world's most important herbicide because it provides broad-spectrum weed control and has favorable environmental characteristics and low mammalian toxicity (Baylis 2000; Woodburn 2000). These characteristics, combined with its cost-effectiveness, have led to frequent applications of glyphosate in perennial cropping systems and non-crop areas in California (Shrestha et al. 2007). However, reliance on herbicides with the same mode of action for extended periods can contribute to weed shifts and the selection of biotypes with resistance to herbicides (Christoffers 1999; Holt 1992) (see page 86). As a result of this selection pressure, cases of glyphosate-resistant rigid rye-grass (*Lolium rigidum*) (Heap 2008; Simarmata et al. 2005) and horse-weed (Shrestha et al. 2007) have been reported in California orchards and non-crop areas, respectively." – Shrestha et.al.[9]

14.2.2 Indaziflam use in apricots for the control of weed biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action satisfies *Criterion IV: The minor use pesticide plays or will play a significant part in an integrated pest (weed) management program.*

Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available in this minor crop, the availability of indaziflam is a critical component of the success of IPM programs for growers. An example of an IPM program that includes indaziflam is shown in Appendix 7 for citrus crops, however similar practices are implemented by growers of apricots.

14.3 References

[1] United States Department of Agriculture – National Agricultural statistics Service. 2017. https://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

[2] Heap I (2014) The international survey of herbicide resistant weeds. May 5, 2014. http://www.weedscience.org, http://weedscience.org/Summary/Country.aspx?CountryID=45

[3] Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor. C. Brabham, Lei Lei, Ying Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Plant Physiol. 166, pp. 1177-1185.

[4] Efficacy of Preemergence Herbicides for Controlling a Dinitroaniline-Resistant Goosegrass (Eleusine indica) in Georgia. Patrick E. McCullough, Jialin Yu, and Diego G´omez de Barreda. 2013. Weed Technology 27:639–644.

[5] Tank Mixing Saflufenacil, Glufosinate, and Indaziflam Improved Burndown and Residual Weed Control. Amit J. Jhala, Analiza H. M. Ramirez, and Megh Singh. 2013. Weed Technology 27:422–429

[6] Influence of soil properties and soil moisture on the efficacy of indaziflam and flumioxazin on *Kocia scoparia* L. D. Sebastian, S. Nissen, P. Westra, D. Shaner, G. Butters. 2017. Pest Manag Sci; 73: 444–451.

[7] Identification of Goosegrass (Eleusine indica) Biotypes Resistant to Preemergence-Applied Oxadiazon. J. Scott McElroy, William B. Head, Glenn R. Wehtje, and David Spak. 2017. Weed Technology 31:675–681.

[8] Current state of herbicides in herbicide-resistant crops. Green, J.M. 2014. Pest Manag Sci 2014; 70: 1351–1357.

[9] Glyphosate-resistant hairy fleabane documented in the Central Valley. 2008. A. Shrestha, B. Hanson and K. Hembree. http://CaliforniaAgriculture.ucop.edu • July–September 2008

15.0 Qualification for Extension of Exclusive Data Use

FIFRA Section 3(c) (1) (F) (ii) allows for the extension of the period of exclusive data use by one additional year for each three minor uses registered within seven years of the initial registration up to a total of three additional years provided that:

> *(I) there are insufficient efficacious alternative registered pesticides available for the use;*
>
> *(II) the alternatives to the minor use pesticide pose greater risks to the environment or human health;*
>
> *(III) the minor use pesticide plays or will play a significant part in managing pest resistance;*
>
> *(IV) the minor use pesticide plays or will play a significant part in an integrated pest management program.*

Table 1 summarized the minor crops on which Indaziflam was registered during the first seven years after initial registration July 26, 2010 and are being used to justify the extension of the exclusive use of data.

(III) the minor use pesticide plays or will play a significant part in managing pest resistance.

> Many of the minor uses qualify in part because Indaziflam will play a significant part in managing pest / disease resistance, especially for resistance-prone pests. Indaziflam functions as significant resistance management tool when used correctly in rotation with the other classes. Indaziflam provides an alternative mode of action. There are numerous uses of Indaziflam that will result in better management of pest resistance. Therefore, these uses should qualify for extensions of exclusive data use.

(IV) the minor use pesticide plays or will play a significant part in an integrated pest management program.

> Many of the minor uses qualify in part because Indaziflam plays or will play a significant part in an integrated pest management program. Indaziflam can be used as an important component of Integrated Pest Management. In addition to key IPM program components such as weed scouting, weed identification, mowing, tillage, and other cultural practices, chemical controls can provide an efficient and effective option to boost the productivity of their crop.(ref Appendix 7) As a pre-emergent weed management tool, it offers growers an additional option for weed management practices on their farm. Due to the limited effective herbicide options available for these minor crops, the availability of indaziflam is a critical component of the success of IPM programs for growers. Therefore, these uses should qualify for extensions of exclusive data use.

16.0 Conclusions

In conclusion, the preceding demonstrates that the registration of Indaziflam on nine or more minor crops meets the criteria for granting a 3-year extension of the exclusive data use period. When the number of alternative modes of action are limited, the future effectiveness of those products and related products are at risk due to resistance, which follows overuse. Indaziflam can replace and/or complement some of these currently used high-risk products, some of which have already shown resistance development. Development of various minor uses were initiated by Bayer following external requests made to IR-4. IR-4 requests (which originate from growers, grower organizations and researchers) demonstrate that there are few or no effective alternatives for control of these weeds.

17.0 Appendices (separate document)

Appendix 1

GROUP	29	HERBICIDE

Indaziflam 200SC Herbicide

ABN: Alion® Herbicide

For Preemergent Weed Control in Blueberry (Highbush) and other Bushberry Subgroup Crops in 13-07B, except blueberry (Lowbush); Caneberry and other Caneberry Subgroup Crops in 13-07A; Citrus Groves; Coffee; Fruit, Small, Vine Climbing, Except Fuzzy Kiwifruit Subgroup 13-07F; Hops; Pome and Stone Fruit, Tree Nuts, Crops in the proposed Crop Subgroup 23A; Small fruit, edible peel subgroup, including Olive, Ornamentals, Christmas Trees, and Conifer Plantations.

ACTIVE INGREDIENT:

Indaziflam*.....19.05%

OTHER INGREDIENTS:.....80.95%

TOTAL: **100.00%**

Contains 1.67 pounds of indaziflam per gallon.

*(CAS No: 730979-19-8)

EPA Reg. No.: 264-1106 **EPA Est. No**

KEEP OUT OF REACH OF CHILDREN

CAUTION

For MEDICAL and TRANSPORTATION Emergencies ONLY Call 24 Hours A Day 1-800-334-7577
For PRODUCT USE Information Call 1-866-99BAYER (1-866-992-2937)

[See additional precautionary statements and directions for use on label.]

FIRST AID

If on skin or clothing:	∞ Take off contaminated clothing. ∞ Rinse skin immediately with plenty of water for 15-20 minutes. ∞ Call a poison control center or doctor for treatment advice.
If inhaled:	∞ Move person to fresh air. ∞ If person is not breathing, call 911 or an ambulance, and then give artificial respiration, preferably mouth-to-mouth if possible. ∞ Call a poison control center or doctor for further treatment advice.
If swallowed:	∞ Call a poison control center or doctor immediately for treatment advice. ∞ Have person sip a glass of water if able to swallow. ∞ Do not induce vomiting unless told to do so by a poison control center or doctor. ∞ Do not give anything to an unconscious person.
For MEDICAL Emergencies Call 24 Hours A Day 1-800-334-7577 Have the product container or label with you when calling a poison control center or doctor or going for treatment.	

Note to physician: No specific antidote is available. Treat symptomatically.

Appendix 1

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION

Harmful if swallowed, absorbed through the skin or inhaled. Avoid contact with skin, eyes, or clothing. Avoid breathing mist.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

All mixers, loaders, applicators and other handlers must wear:

- ∞ long-sleeved shirt and long pants.
- ∞ shoes plus socks.
- ∞ waterproof gloves.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

ENGINEERING CONTROLS STATEMENTS

When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

USER SAFETY RECOMMENDATIONS:
Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
Users should remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change clothing.

ENVIRONMENTAL HAZARDS

This product is toxic to fish, aquatic invertebrates, and plants. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean watermark. Do not contaminate water when disposing of equipment rinsate or washwater. This product may enter water through spray drift or runoff. Follow directions for use to avoid spray drift and runoff. A level well maintained vegetative buffer strip between areas to which this product is applied and surface water features including ponds, streams, and springs will reduce the potential of this product entering water from rainfall-runoff. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours.

Surface Water Advisory: This pesticide may impact surface water quality due to runoff of rainwater. This is especially true for poorly draining soils with shallow ground water. This product is classified as having high potential for reaching surface water via runoff for several months or more after application.

Ground Water Advisory: This pesticide has properties and characteristics associated with chemicals detected in ground water. This chemical may leach into ground water if used in areas where soils are permeable, particularly where the water table is shallow.

Appendix 1

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.
Read the entire label before using this product

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

SHAKE CONTAINER WELL BEFORE USING.
IN THE STATE OF NEW YORK ONLY: NOT FOR SALE, DISTRIBUTION OR USE IN NASSAU OR SUFFOLK COUNTY.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry intervals. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

Coveralls

Shoes plus socks

Chemical resistant gloves made of any waterproof material

PRODUCT INFORMATION

Indaziflam 200SC Herbicide is formulated as a suspension concentrate of indaziflam at a concentration of 1.67 pounds of active ingredient per gallon.

Indaziflam 200SC Herbicide is a preemergence herbicide for control of annual grasses and broadleaf weeds in Blueberry (Highbush) and other Bushberry Subgroup Crops in 13-07B, except blueberry (Lowbush); Caneberry and other Caneberry Subgroup Crops in 13-07A; Citrus Groves; Coffee; Fruit, Small, Vine Climbing, Except Fuzzy Kiwifruit Subgroup 13-07F; Hops; Pome and Stone Fruit, Tree Nuts, Crops in the proposed Crop Subgroup 23A; Small fruit, edible peel subgroup, including Olive, Ornamentals, Christmas Trees, and Conifer Plantations. Indaziflam 200SC Herbicide may be applied to the soil as a uniform broadcast or band application for the prevention of new weed emergence.

Indaziflam 200SC Herbicide provides preemergence, residual control of weeds. A dry soil surface at time of application and 48 hours after application is optimum for binding the active ingredient to soil particles and preventing its downward movement to the crop's roots. Moisture is needed for activation of Indaziflam 200SC Herbicide. Dry soil conditions following the initial 48-hour period after application of Indaziflam 200SC Herbicide may result in reduced weed control. Weeds that germinate prior to activation by rain or irrigation may not be controlled. If weeds have emerged, the addition of a foliar active herbicide is needed. Indaziflam 200SC Herbicide applied alone will not control weeds that are already emerged. Refer to the "Tank Mix Instructions" section.

This product controls weeds by inhibiting cellulose biosynthesis in plants. It may be applied at any time when the ground is not frozen or covered with snow. It will provide most effective residual weed control when applied to a dry soil surface followed by 48 hours without irrigation or rain, and then followed by adequate moisture from rain or an irrigation event within 21 days and prior to weed seed germination. Weed seeds and seedlings must come into contact with Indaziflam 200SC Herbicide prior to emergence to be controlled. If insufficient moisture is present, some weeds may germinate and emerge from below the treated layer of soil. Avoid using Indaziflam 200SC Herbicide in areas where soil runoff or erosion is likely to occur.

Excessive crop or weed debris present on the soil surface at the time of application may prevent a uniform distribution of the product reaching the soil and consequently may reduce weed control. Performance may be improved by removing the debris prior to applying Indaziflam 200SC Herbicide. In very dense stands of living weeds, an application of a foliar active herbicide first then followed 3-6 weeks later with the application of Indaziflam 200SC Herbicide is recommended for improved performance.

The level of weed control is dependent on many variables including soil texture, moisture, temperature, weed species present, the amount of weed seed present in the soil, and the crop canopy.

Do not apply within 25 feet of ponds, lakes, rivers, streams, wetlands, and habitat containing aquatic and semi-aquatic plants.

The Pre-Harvest Interval (PHI) is 7 days for citrus and 14 days for all other crops listed on this label.

Appendix 1

PRECAUTIONS FOR USE

- Avoid direct or indirect spray contact with crop foliage, green bark, roots, or fruit as it may cause localized crop injury or death. Only trunks with callused, mature brown bark may be sprayed with Indaziflam 200SC Herbicide. If the trunks are not fully callused mature brown bark, they should not be sprayed unless protected from spray contact by nonporous wraps, grow tubes or waxed containers. Contact of Indaziflam 200SC Herbicide with tissues other than mature brown bark may result in serious damage or plant death.
- The soil surface where Indaziflam 200SC Herbicide is to be applied should not have open channels or cracks in the soil. This is to prevent the product from reaching the crop roots either through direct contact from the spray application or with water movement from rain or irrigation as this may cause crop injury. If depressions in the soil such as from settling following transplanting exist around the base of the crop, fill them in with soil prior to applying Indaziflam 200SC Herbicide. Crops that are stressed may be more sensitive to herbicide injury and should not be treated.
- Weed control activity may be reduced if the application is made to soil covered in heavy crop or weed debris that prevents a uniform distribution of the product reaching the soil. Removing the debris prior to applying Indaziflam 200SC Herbicide may improve weed control.
- Rates provided on this label are based on broadcast treatment. For banded applications, reduce the broadcast rate of Indaziflam 200SC Herbicide to the proportion of the field being treated. No area of the field may be treated with more than the highest rate provided on this label regardless of the portion of the field that this represents.
- Do not use in crops that exhibit low vigor or poor health as they may be more susceptible to crop injury. Causes of reduced vigor may include such things as previous pesticide applications, excess fertilizer or salt, diseases, insects, nematodes, drought, flooding, wind damage, frost, nutrient deficiency, or mechanical damage.

RESTRICTIONS FOR USE

- Indaziflam 200SC Herbicide can only be applied in citrus trees established for a minimum of one year after transplanting and exhibiting normal growth and good vigor or in new Citrus Groves one month after planting if the transplanted trees were potted plants (such as citripots) and not bare-rooted, the trunks are protected from spray contact by nonporous wraps, grow tubes or waxed containers, and the trees are actively growing and exhibiting good health and vigor.
- Indaziflam 200SC Herbicide can only be applied in labeled tree nut crops (except pecan) that have been established for a minimum of one year after transplanting and exhibiting normal growth and good vigor.
- Indaziflam 200SC Herbicide can only be applied in labeled pome and stone fruit, pecan, and olive that have been established for a minimum of three years after transplanting and exhibiting normal growth and good vigor.
- Do not use on soils with 20% or more gravel content. To determine gravel content do not remove gravel from soil samples before sending the samples for soil texture analysis, and request that gravel content be included in the analysis. The gravel content (greater than 2 mm or 0.079 inches in size, US standard sieve size 10) is defined as total percent gravel by weight before conducting soil texture analysis.
- Determine soil organic matter content (%OM) of specific orchards, vineyards, and groves by having soil core samples to a minimum depth of 6 inches of soil analyzed.
- Do not apply more than the amount of Indaziflam 200SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, percent organic matter content, application site, and crop.
- Allow at least 90 days between applications of Indaziflam 200SC Herbicide.
- Only use in vineyards where the grapes have at least 6 inches of soil barrier between the soil surface and the major portion of the root system.
- Indaziflam 200SC Herbicide can only be applied in grapes that have been established for a minimum of three years after transplanting and exhibiting normal growth and good vigor.
- Do not apply this product through any type of irrigation system.
- Use of spot spraying around desired plants is not allowed due to the variability of the actual application rate. Excessive application rates may result in severe crop injury or death.
- Do not apply this product by aerial application.
- Do not harvest citrus crops within 7 days after the application of Indaziflam 200SC Herbicide.
- Do not harvest crops other than citrus within 14 days after the application of Indaziflam 200SC Herbicide.
- Only crops listed on this label may be replanted or rotated within 24 months after the last application of Indaziflam 200SC Herbicide and while following the instructions listed in the "Rotational Crop Restrictions" section.
- Do not apply this product to frozen or snow covered soil.
- Do not apply this product to water-saturated soil.

- ∞ Do not flood-irrigate orchards or vineyards containing stone fruit, pome fruit, grapes, tree nuts, or olives within 60 days following application of Indaziflam 200SC Herbicide.
- ∞ Do not apply irrigation, exclusive of flood-irrigation, to treated areas within 48 hours after application.
- ∞ Do not apply within 25 feet of ponds, lakes, rivers, streams, wetlands, and habitat containing aquatic and semi-aquatic plants.
- ∞ Do not use Indaziflam 200SC Herbicide in Nassau and Suffolk Counties of New York State.

SPRAY DRIFT MANAGEMENT

Spray equipment and weather affect spray drift. Consider all factors when making application decisions. Where states have more stringent regulations, they must be observed. Avoiding spray drift is the responsibility of the applicator or grower. To reduce the potential for drift, the application equipment must be set to apply medium to large droplets (i.e., ASAE ~~Standard~~ S-572.1) with corresponding spray pressure. Use high flow rate nozzles to apply the highest practical spray volume. With most nozzle types, narrower spray angles produce larger droplets. Follow the nozzle manufacturer's directions on pressure, orientation, spray volume, etc., in order to minimize drift and optimize coverage and control.

Wind

Avoid making applications when spray particles may be carried by air currents to areas where sensitive crops and plants are growing. Do not spray near sensitive plants if wind is gusty, below 2 mph, or in excess of 10 mph and moving in the direction of adjacent areas of sensitive crops or plants. Do not apply during temperature inversions. Always make applications when there is some air movement to determine the direction and distance of possible spray drift.

Local terrain may influence wind patterns; the applicator should be familiar with local conditions and understand how they may impact spray drift. Boom or nozzle shielding can reduce the effects of wind or air currents on drift. Verify that the shields do not interfere with uniform deposition of product prior to application.

Temperature Inversion

A surface temperature inversion (i.e., increasing temperature with increasing altitude) greatly increases the potential for drift. Avoid application when conditions are favorable to inversion. Presence of ground fog is a good indicator of a surface temperature inversion.

Sensitive Areas

Sensitive areas to Indaziflam 200SC Herbicide are defined as natural bodies of water (ponds, lakes, rivers, and streams), wetlands, habitats of endangered species and non-labeled agricultural crop areas. Applicators must take all precautions necessary to minimize spray drift to these sensitive areas.

APPLICATION INFORMATION

Indaziflam 200SC Herbicide can only be applied by ground equipment. Do not apply by aerial equipment, chemigation, or spot spraying around desired plants.

Apply Indaziflam 200SC Herbicide alone or in an approved tank mixture in a minimum of 10 gallons of spray mixture per acre. Use higher spray volumes to improve distribution in high densities of emerged weeds or debris. Uniform, thorough spray coverage directed to the soil at the base of the crop is important to achieve consistent weed control. Do not allow spray to directly or indirectly contact crop foliage, green bark, roots, or fruit as it may cause localized crop injury. Application may be made as a broadcast treatment or as a banded treatment under vineyard, grove, or orchard crops. When making banded applications use proportionately less spray water and Indaziflam 200SC Herbicide. The dosage listed on this label is for the treated area of the field regardless of the portion of the field that this represents.

Application Equipment

To minimize spray drift to non-target areas, apply this product using nozzles that deliver a medium or larger spray droplet as defined by the ASAE ~~standard~~ S-572.1 and as shown in nozzle manufacturer's catalogues. Keep the spray boom at the lowest possible spray height recommended by the nozzle manufacturer above the target surface. Refer to nozzle manufacturer's recommendations for proper nozzle, pressure setting and sprayer speed for optimum product performance and minimal spray drift. Use sprayers that provide accurate and uniform application to ensure proper distribution. An off-center (OC) nozzle located at the end of the boom may be used to spray near the trunk but must be oriented so that it directs spray to avoid spray contact with crop foliage and green bark. **Maintain adequate agitation at all times including momentary stops. Since settling may occur and be difficult to get back into suspension, spray solution should not be left in the tank overnight.**

Ensure that the spray equipment including spray tank, pumps, lines, filters, screens, and nozzles are clean and free of residue from previous use before mixing and applying Indaziflam 200SC Herbicide by following the instructions listed under SPRAYER CLEANUP PROCEDURE. Residue remaining in the spray equipment from previous uses can cause crop injury if not properly cleaned. After applying Indaziflam 200SC Herbicide, follow the cleaning instructions again to ensure that no product remains in the spray equipment.

Appendix 1

Uniform thorough spray coverage is important to achieve consistent weed control. Select nozzles, pressure, and application speed that will deliver medium or larger droplets. Verify that application equipment is in good working condition and is properly calibrated to apply the correct amount of product.

Application Method

Broadcast Applications

For all crops listed on this label, apply Indaziflam 200SC Herbicide at rates described in the **Dose Rate Chart** in the **APPLICATION DIRECTIONS** section for the specific crop or site where this product will be used.

Banded Applications

When making banded applications, use the same dosage rate as for broadcast applications but use proportionately less spray water and Indaziflam 200SC Herbicide. The use rate provided is for the treated area of the field regardless of the portion of the field that it represents. Banded applications may be made using the following formula to calculate the amount of herbicide and spray volume needed for orchard or vineyard strip sprays:

Treated Band width in Inches / Row width in Inches	X	HERBICIDE Rate per Treated Acre	=	Amount of HERBICIDE needed for treatment
Treated Band width in Inches / Row width in Inches	X	SPRAY VOLUME per Treated Acre	=	Amount of Spray Volume needed for treatment

Tank Mix Instructions

Indaziflam 200SC Herbicide may be mixed with and applied in combination with most commonly used pesticides registered for use in the approved crops to expand the spectrum of weed control. Indaziflam 200SC Herbicide will generally provide little or no control of weeds that are already emerged or established at the time of application. When weeds are emerged at application, the addition of a labeled foliar active herbicide such as Rely® 280 Herbicide is needed. Only use products that are approved for use in the crop to which the tank mixture is to be applied.

If Indaziflam 200SC Herbicide is to be tank mixed with liquid fertilizers, other pesticides, or additives, compatibility should be tested prior to mixing. To test for compatibility, use a small container and mix a small amount (0.5 to 1 qt) of spray, combining all ingredients in the same ratio and mixing order as the anticipated use. If any indications of physical incompatibility develop, do not use this mixture for spraying. Indications of incompatibility usually appear 5 - 15 minutes after mixing.

~~Read and follow the label of each tank mix partner used with Indaziflam 200SC Herbicide for all precautionary statements, directions for use, geographic and other restrictions. When tank mixing products with different restrictions, follow the directions of the most restricted label.~~

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

Mixing Instructions

Ensure that the application equipment has been thoroughly cleaned from previous use before using to apply Indaziflam 200SC Herbicide. Follow the steps listed below:

1. Shake container well to ensure that the product is thoroughly suspended prior to measuring in case some settling has occurred during shipping or storage.
2. Fill the spray tank with 1/2 of the required volume of water prior to the addition of Indaziflam 200SC Herbicide.
3. With the pump and agitator running, add the proper amount of Indaziflam 200SC Herbicide first.
4. Once the Indaziflam 200SC Herbicide is completely dispersed, add any other pesticides, fertilizers or additives if they are to be applied with Indaziflam 200SC Herbicide.
5. Add the rest of the water to the desired volume while maintaining sufficient agitating.

Continue agitation while mixing and during application to ensure a uniform spray mixture.

Re-suspending SC Products in Spray Solution: Like other suspension concentrates (SCs), Indaziflam 200SC Herbicide will settle if left standing without agitation. Reagitate the spray solution for a minimum of 10 minutes before application.

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Weed Control

Indaziflam 200SC Herbicide provides residual control of susceptible grass and broadleaf weeds when applied prior to germination. Best weed control is obtained when Indaziflam 200SC Herbicide is applied to a dry soil surface followed by 48 hours without irrigation or rain, and then followed by adequate moisture from rain or an irrigation event within 21 days and prior to weed seed germination and adequate rain or irrigation is received soon after application and prior to weed germination. Supplemental irrigation may be applied following application to improve weed control.

The weed control activity may be reduced if the application is made to dense weed vegetation or to soil covered in heavy crop or weed debris that prevents a uniform distribution of the product reaching the soil. Removing the debris and / or controlling the existing weeds prior to applying Indaziflam 200SC Herbicide may improve weed control. In very dense stands of living weeds, an application of a foliar active herbicide first then followed 3-6 weeks later with the application of Indaziflam 200SC Herbicide is recommended for improved performance.

If weeds are emerged at application, the addition of a foliar active herbicide is needed. The spectrum of weed control may be increased when Indaziflam 200SC Herbicide is tank mixed with other herbicides. Refer to Tank Mix Instructions section.

Rate Ranges

Select proper use rate based on crop or application site and soil texture and percent organic matter content. Soils with high clay content may require a higher use rate of Indaziflam 200SC Herbicide than soils with low clay content. Where rate ranges are given, use lower rates within the range on coarser textured soils and higher rates within the range on finer textured soils. Using the higher rates will provide longer weed control and may also improve control in fields with heavy weed or crop debris.

If individual orchards, vineyards, or citrus groves have multiple %OM contents throughout the area where Indaziflam 200SC Herbicide is to be applied by a single tank or tank mix, then use the lowest rate of Indaziflam 200SC Herbicide corresponding to the lowest %OM content for that area.

Indaziflam 200SC Herbicide may be used on soils with greater than 10% organic matter; however, the length and level of weed control may be reduced compared to soils with lower organic matter.

Weeds Controlled by 3.5 to 6.5 Fl oz/Ac Indaziflam 200SC Herbicide			
Broadleaves		**Grasses**	
Common Name	**Genus/Species**	**Common Name**	**Genus/Species**
Amaranth, spiny	*Amaranthus spinosus*	Barley, mouse	*Hordeum murinum*
Buckwheat, wild *	*Polygonum convolvulus*	Barnyardgrass, common	*Echinochloa crus-galli*
Burclover, California *	*Medicago polymorpha*	Bluegrass, annual	*Poa annua*
Buttercup, corn *	*Ranunculus arvensis*	Brome, downy	*Bromus tectorum*
Carpetweed	*Mollugo verticillata*	Brome, foxtail	*Bromus rubens*
Catsear, spotted ***	*Hypochoeris radicata*	Bromegrass, ripgut	*Bromus rigidus*
Celery, wild *	*Apium leptophyllum*	Cheat	*Bromus secalinus*
Chickweed, common	*Stellaria media*	Crabgrass, large	*Digitaria sanguinalis*
Chickweed, mouse-ear	*Cerastium vulgatum*	Crabgrass, smooth	*Digitaria ischaemum*
Clover, crimson ***	*Trifolium incarnatum*	Cupgrass, southwestern	*Eriochloa gracilis*
Clover, red *	*Trifolium pratense*	Foxtail, giant	*Setaria faberi*
Clover, white ***	*Trifolium repens*	Foxtail, green	*Setaria viridis*
Cudweed, purple	*Gnaphalium purpureum*	Foxtail, yellow	*Pennisetum glaucum*
Dandelion, common (seedling)	*Taraxacum officinale*	Goosegrass	*Eleusine indica*
Eveningprimrose, cutleaf *	*Oenothera laciniata*	Guineagrass	*Panicum maximum*
Fiddleneck, coast	*Amsinckia intermedia*	Junglerice	*Echinochloa colonum*
Filaree, redstem / Storksbill	*Erodium cicutarium*	Lovegrass, tufted	*Eragrostis pectinacea*
Filaree, whitestem	*Erodium moschatum*	Millet, wild proso	*Panicum miliaceum*
Fleabane, hairy	*Erigeron bonariensis*	Oat, wild	*Avena fatua*
Geranium, Carolina	*Geranium carolinianum*	Panicum, fall	*Panicum dichotomiflorum*
Groundsel, common	*Senecio vulgaris*	Panicum, Texas *	*Panicum texanum*
Henbit *	*Lamium amplexicaule*	Ryegrass, Italian (annual)	*Lolium multiflorum*
Horseweed / Marestail	*Erigeron canadensis*	Signalgrass, broadleaf	*Brachiaria platyphylla*
Indigo, Hairy	*Indigofera hirsuta*	Sprangletop, bearded	*Leptochloa fascicularis*
Knotweed, prostrate *	*Polygonum aviculare*		

Appendix 1

Weeds Controlled by 3.5 to 6.5 Fl oz/Ac Indaziflam 200SC Herbicide			
Broadleaves		Grasses	
Common Name	Genus/Species	Common Name	Genus/Species
Kochia	*Kochia scoparia*	Sprangletop, Mexican	*Leptochloa uninervia*
Lambsquarters, common **	*Chenopodium album*		
Lettuce, prickly *	*Lactuca serriola*		
Mallow, common *	*Malva neglecta*		
Mallow, little/ Cheeseweed	*Malva parviflora*		
Morningglory, ivyleaf *	*Ipomoea hederacea*		
Morningglory, pitted	*Ipomoea lacunosa*		
Mustard, black	*Brassica nigra*		
Mustard, wild	*Sinapis arvensis*		
Nettle, stinging	*Urtica dioica*		
Pigweed, prostrate	*Amaranthus blitoides*		
Pigweed, redroot	*Amaranthus retroflexus*		
Pigweed, smooth	*Amaranthus hybridus*		
Plantain, buckhorn	*Plantago lanceolata*		
Prickly sida / Teaweed	*Sida spinosa*		
Puncturevine, Common *	*Tribulus terrestris*		
Purslane, common	*Portulaca oleracea*		
Purslane, horse	*Trianthema portulacastrum*		
Pusley, Brazilian ***	*Richardia brazilensis*		
Pusley, Florida	*Richardia scabra*		
Ragweed, common *	*Ambrosia elatior*		
Redmaids	*Calandrinia caulescens*		
Rocket, London	*Sisymbrium irio*		
Sesbania, hemp / Coffeebean	*Sesbania exaltata*		
Shepherd's-purse	*Capsella bursa-pastoris*		
Smartweed, Pennsylvania	*Polygonum pensylvanicum*		
Smellmelon	*Cucumis melo*		
Sorrel, red *	*Rumex acetosella*		
Sowthistle, annual	*Sonchus oleraceus*		
Sowthistle, spiny	*Sonchus asper*		
Spanishneedles *	*Bidens bipinnata*		
Spurge, garden	*Euphorbia hirta*		
Spurge, prostrate	*Euphorbia supina*		
Spurge, spotted	*Euphorbia maculata*		
Spurry, corn	*Spergula arvensis*		
Sunflower, common *	*Helianthus annuus*		
Swinecress	*Coronopus didymus*		
Thistle, Russian	*Salsola kali*		
Velvetleaf	*Abutilon theophrasti*		
Vetch, purple	*Vicia benghalensis*		
Willowherb, panicle	*Epilobium brachycarpum*		
Woodsorrel, common yellow *	*Oxalis stricta*		
Woodsorrel, Florida yellow	*Oxalis florida*		

* Denotes partial control of these weeds

** Consistent control dependent on timely activation by rain or irrigation

*** Seedling control only

Appendix 1

APPLICATION DIRECTIONS FOR USE ON BLUEBERRY (HIGHBUSH) AND OTHER BUSHBERRY SUBGROUP CROPS IN 13-07B (Aronia berry; blueberry, highbush; buffalo currant; Chilean guava; cranberry, highbush; currant, black; currant, red; elderberry; European barberry; gooseberry; honeysuckle, edible; huckleberry; jostaberry; Juneberry (Saskatoon berry); lingonberry; native currant; salal; sea buckthorn; cultivars, varieties, and/or hybrids of these including rabbiteye blueberries, except blueberry (lowbush).

Only use Indaziflam 200SC Herbicide in established plantings at least one year after the bushes have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 200SC Herbicide to blueberries and bushberries where the soil has completely settled around the bushes and there are no exposed roots, open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Blueberry (Highbush) and Bushberry Plantings and other 13-07B crops except blueberry (lowbush)

Soil Texture	Indaziflam 200SC Herbicide (fl oz product / broadcast acre)			Minimum Plant Age
Sand	Do Not Use			
Any other soil except those that contain 20% or greater gravel content	Soil percent Organic Matter Content	Rate Per Application	Max Rate Per Year	1 year*
	%	fl oz/A	fl oz/A	
	< 1	3.5 (0.045 lb ai/A)	7.0 (0.09 lb ai/A)	
	≥ 1	5.0 (0.065 lb ai/A)	10.0 (0.13 lb ai/A)	

Do not apply more than a total of 7.0 fl oz product/A (0.09 lb ai/A) per year on soils containing < 1 % organic matter content, or 10.0 fl oz product/A (0.13 lb ai/A) per year on soils containing ≥1 % organic matter content in a 12 month period when used in any highbush blueberry or bushberry planting.

Only apply Indaziflam 200SC Herbicide to soil as a dormant application in late fall through early spring before bud swell.

Apply Indaziflam 200SC Herbicide as a directed application to the soil beneath the bushes.

When making more than one application per year, allow a minimum of 90 days between applications.

Do not apply more than one application of Indaziflam 200SC Herbicide per cropping season per year in California

Do not use in Blueberry (HighBush) and other Bushberry 13-07B crops grown in sand.

Do not use on soils with 20% or more gravel content.

Do not allow spray to contact green stems, foliage, flowers, or berries or unacceptable injury may occur.

***Only use** Indaziflam 200SC Herbicide in established plantings at least three years after the bushes have been planted and exhibiting normal growth and good vigor in California.

Appendix 1

APPLICATION DIRECTIONS FOR USE ON CANEBERRY AND OTHER CANEBERRY SUBGROUP CROPS IN 13-07A (Blackberry; loganberry; raspberry, black and red; wild raspberry; cultivars, varieties, and/or hybrids of these)

Only use Indaziflam 200SC Herbicide in established plantings at least one year after the bushes have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 200SC Herbicide to caneberries where the soil has completely settled around the bushes and there are no exposed roots, open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Caneberry Plantings

Soil Texture	Indaziflam 200SC Herbicide (fl oz product / broadcast acre)			Minimum Plant Age
Sand	Do Not Use			
Any other soil except those that contain 20% or greater gravel content	Soil percent Organic Matter Content	Rate Per Application	Max Rate Per Year	1 year*
	%	fl oz/A	fl oz/A	
	< 1	3.5 (0.045 lb ai/A)	7.0 (0.09 lb ai/A)	
	≥ 1	5.0 (0.065 lb ai/A)	10.0 (0.13 lb ai/A)	

Do not apply more than a total of 7.0 fl oz product/A (0.09 lb ai/A) per year on soils containing < 1 % organic matter content, or 10.0 fl oz product/A (0.13 lb ai/A) per year on soils containing ≥1 % organic matter content in a 12 month period when used in any caneberry planting.

Only apply Indaziflam 200SC Herbicide to soil as a dormant application in late fall through early spring before bud swell.

Do not apply more than one application of Indaziflam 200SC Herbicide per cropping season per year in California.

When making more than one application per year, allow a minimum of 90 days between applications.

Apply Indaziflam 200SC Herbicide as a directed application to the soil beneath the canes.

Do not use in Caneberry 13-07A grown on sand.

Do not use on soils with 20% or more gravel content.

Do not allow spray to contact green stems, foliage, flowers, or berries or unacceptable injury may occur.

***Only use** Indaziflam 200SC Herbicide in established plantings at least three years after the bushes have been planted and exhibiting normal growth and good vigor in California.

Appendix 1

APPLICATION DIRECTIONS FOR USE IN CITRUS GROVES

Only apply Indaziflam 200SC Herbicide in citrus groves where the soil has completely settled around citrus trees and there are no open channels or depressions in the soil that would allow the product to move into the root zone through open channels.

Citrus Crops: Crop group 10 including Australian desert lime; Australian finger-lime; Australian round lime; Brown River finger lime; calamondin; citron; citrus hybrids; clementine; grapefruit; Japanese summer grapefruit; kumquat; lemon; lime; Mediterranean mandarin; mount white lime; New Guinea wild lime; orange, sour; orange, sweet; pummelo; Russell River lime; satsuma mandarin; sweet lime; tachibana orange; Tahiti lime; tangelo; tangerine (mandarin); tangor; trifoliate orange; uniq fruit; cultivars, varieties, and or hybrids of these

Dose Rate Chart for Citrus Groves

Soil Texture	Indaziflam 200SC Herbicide (fl oz product / broadcast acre)
Any soil except those that contain 20% or greater gravel content	5.0 to 6.5 fl oz/A (0.065 to 0.085 lb ai/A)

Do not apply more than 10.3 fl oz product/A (0.134 lb ai/A) per year or in a 12 month period.
When making more than one application per year, allow a minimum of 90 days between applications.

Use in Established Groves:

Only apply Indaziflam 200SC Herbicide in groves where the trees have been established for a minimum of one year after transplanting.

Use in Recently Planted Citrus Groves:
Indaziflam 200SC Herbicide may be used in groves planted a minimum of one month provided the following condition exists:

1) The transplanted trees were potted plants (such as citripots) and not bare-rooted.
2) The trunks are protected from spray contact by nonporous wraps, grow tubes, or waxed containers.
3) The trees are actively growing and exhibiting good health and vigor.

Avoid direct or indirect spray contact with crop foliage, green bark, roots, or fruit as it may cause localized crop injury or death. Only the trunks of trees transplanted more than one year may be sprayed with Indaziflam 200SC Herbicide if the trunk is callused, mature brown bark. Contact of Indaziflam 200SC Herbicide with tissues other than mature brown bark can result in serious damage or plant death.

Appendix 1

APPLICATION DIRECTIONS FOR USE ON COFFEE

Only use Indaziflam 200SC Herbicide in established plantings at least one year after the shrubs have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 200SC Herbicide to coffee shrubs where the soil has completely settled around the shrubs and there are no open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Coffee

Soil Texture	**Indaziflam 200SC Herbicide (fl oz product / broadcast acre)**			
Any soil except those that contain 20% or greater gravel content	Soil percent Organic Matter Content	Maximum Rate of First Application	Maximum Rate of Second Application	Max Rate Per Year
	%	fl oz/A	fl oz/A	fl oz/A
	< 1	3.5 (0.045 lb ai/A)	3.5 (0.045 lb ai/A)	7.o (0.091 lb ai/A)
	1 to 3	5.0 (0.065 lb ai/A)		8.5 (0.11 lb ai/A)
	> 3	6.8 (0.089 lb ai/A)		10.3 (0.134 lb ai/A)

Do not apply more than the amount of Indaziflam 200SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, percent organic matter content, application site, and crop. When making more than one application per year, allow a minimum of 90 days between applications.

Do not use on soils with 20% or more gravel content.
Do not apply more than 10.3 fl oz product/A (0.134 lb ai/A) per year or in a 12 month period when used in Coffee.

Do not use in coffee grown on sand.

Do not allow spray to contact green stems, foliage, flowers, or beans or unacceptable injury may occur.

Appendix 1

FRUIT, SMALL, VINE CLIMBING, EXCEPT FUZZY KIWIFRUIT SUBGROUP 13-07F including: Amur river grape; gooseberry; grape; kiwifruit, hardy; maypop; schisandra berry; cultivars, varieties, and/or hybrids of these

Only use Indaziflam 200SC Herbicide in established vineyards at least three years after the vines have been planted and exhibiting normal growth and good vigor. Ensure that the grapes have 6 inches of soil barrier between the soil surface and the major portion of the root system prior to using Indaziflam 200SC Herbicide or injury may occur.

Dose Rate Chart for Grape Vineyards and other 13-07F Crops

Soil Texture	**Indaziflam 200SC Herbicide (fl oz product / broadcast acre)**			**Minimum Vine Age**
Sand	Do Not Use			
Any other soil except those that contain 20% or greater gravel content	Soil percent Organic Matter Content	Rate Per Application	Max Rate Per Year	3 years
	%	fl oz/A	fl oz/A	
	<1	3.5 to 5.0 (0.045 to 0.065 lb ai/A)	5.0 (0.065 lb ai/A)	
	≥1	3.5 to 5.0 (0.045 to 0.065 lb ai/A)	5.0 (0.065 lb ai/A)	

Do not apply more than the amount of Indaziflam 200SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, percent organic matter content, application site, and crop.

Do not use in grapes grown in Florida or Georgia.

Do not use in grapes and other 13-07F crops grown in sand.

Do not use on soils with 20% or more gravel content.

Do not apply more than a total of 5.0 fl oz product/A (0.065 lbs ai/A) per year or in a 12 month period when used in grape vineyards and other 13-07F crops.

When making more than one application per year, allow a minimum of 90 days between applications.

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APPLICATION DIRECTIONS FOR USE ON HOPS

Only use Indaziflam 200SC Herbicide in established plantings at least one year after the vines have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 200SC Herbicide to hops vines where the soil has completely settled around the vines and there are no exposed roots, open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Hops

Soil Texture	**Indaziflam 200SC Herbicide (fl oz product / broadcast acre)**			**Minimum Plant Age**
Sand	Do Not Use			
Any other soil except those that contain 20% or greater gravel content	Soil percent Organic Matter Content	Rate Per Application	Max Rate Per Year	1 year
	%	fl oz/A	fl oz/A	
	< 1	3.5 (0.045 lb ai/A)	7.0 (0.09 lb ai/A)	
	≥ 1	5.0 (0.065 lb ai/A)	10.0 (0.13 lb ai/A)	

Do not apply more than a total of 7.0 fl oz product/A (0.09 lb ai/A) per year on soils containing < 1 % organic matter content, or 10.0 fl oz product/A (0.13 lb ai/A) per year on soils containing ≥1 % organic matter content in a 12 month period when used in any hops planting.

Do not apply more than two applications of Indaziflam 200SC Herbicide per year.

Application timings can be made as an early spring dormant application and/or as a fall dormant application after vine harvest. The early spring dormant timing can be made on hop shoots that are in the bud stage up to 2" in height.

Apply Indaziflam 200SC Herbicide as a minimum 2-foot band to each side of the hop row.

Do not use in hops grown on sand.

Do not use on soils with 20% or more gravel content.

Do not allow spray to contact green stems, foliage, flowers, or cones or unacceptable injury may occur.

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APPLICATION DIRECTIONS FOR USE IN POME and STONE FRUIT, TREE NUTS, AND CROPS IN THE PROPOSED CROP SUBGROUP 23A; SMALL FRUIT, EDIBLE PEEL SUBGROUP, INCLUDING OLIVE.

For use in pome and stone fruit, pecan, and crops in the proposed Crop Subgroup 23A; Small fruit, edible peel subgroup, including olive, only use Indaziflam 200SC Herbicide in orchards where the trees have been established at least three years and exhibiting normal growth and good vigor.

For use in tree nuts, except pecan, only use Indaziflam 200SC Herbicide in orchards where the trees have been established at least one year and exhibiting normal growth and good vigor.

If cracks in the soil or depressions from transplanting are present, fill them in prior to applying Indaziflam 200SC Herbicide.

Pome Fruit Crop group 11 including: apple; azarole; crabapple; loquat; mayhaw; medlar; pear; pear, Asian; quince; quince, Chinese; quince, Japanese; tejocote; cultivars, varieties, and/or hybrids of these

Stone Fruit Group 12-12 including: Apricot; apricot, Japanese; capulin; cherry, black; cherry, Nanking; cherry, sweet; cherry, tart; Jujube, Chinese; nectarine; peach; plum; plum, American; plum, beach; plum, Canada; plum, cherry; plum, Chickasaw; plum, Damson; plum, Japanese; plum, Klamath; plum, prune; plumcot; sloe; cultivars, varieties, and/or hybrids of these

Tree Nuts: Crop group 14-12 including: African nut-tree; almond; beechnut; Brazil nut; Brazilian pine; bunya; bur oak; butternut; Cajou nut; candlenut; cashew; chestnut; chinquapin; coconut; coquito nut; dika nut; ginkgo; Guiana chestnut; hazelnut (filbert); heartnut; hickory nut; Japanese horse-chestnut; macadamia nut; mongongo nut; monkey-pot; monkey puzzle nut; Okari nut; Pachira nut; peach palm nut; pecan; pequi; Pili nut; pine nut; pistachio; Sapucaia nut; tropical almond; walnut, black; walnut, English; yellowhorn; cultivars, varieties, and/or hybrids of these

Crops in the proposed Crop Subgroup 23A: Small fruit, edible peel subgroup including: Acerola; African plum; agritos, almondette; appleberry; arbutus berry; bayberry, red; bignay; breadnut; cabeluda; carandas-plum; Ceylon iron wood; Ceylon olive; cherry-of-the-Rio-Grande; Chinese olive, black; Chinese olive, white; chirauli-nut; cocoplum; desert-date; false sandalwood; fragrant manjack; gooseberry, Abyssinian; gooseberry, Ceylon; gooseberry, otaheite; governor's plum; grumichama; guabiroba; guava berry; guava, Brazilian; guava, Costa Rican; guayabillo; illawarra plum; Indian-plum; Jamaica-cherry; jambolan; kaffir-plum; kakadu plum; kapundung; karnada; lemon aspen; mombin, yellow; monos plum; mountain cherry; olive; persimmon, black; pitomba; plum-of-Martinique; rukam; rumberry; sea grape; sete-capotes; silver aspen; water apple; water pear; water berry; wax jambu.

Dose Rate Chart for Pome and Stone Fruit, Tree Nuts, and Crops in the Proposed Crop Subgroup 23A; Small Fruit, Edible Peel Subgroup, Including Olive.

Soil Texture	**Indaziflam 200SC Herbicide (fl oz product / broadcast acre)**			
Any soil except those that contain 20% or greater gravel content	Soil percent Organic Matter Content	Rate Per Application	Max Rate Per Year	Minimum Days Between Applications
	%	fl oz/A	fl oz/A	Days
	<1	3.5 to 6.5 (0.045 to 0.085 lb ai/A)	6.0 to 10.3 (0.078 to 0.134 lb ai/A)	90
	1 to 3	3.5 to 6.5 (0.045 to 0.085 lb ai/A)	8.0 to 10.3 (0.104 to 0.134 lb ai/A)	
	> 3	3.5 to 6.5 (0.045 to 0.085 lb ai/A)	10.3 (0.134 lb ai/A)	

Do not apply more than the amount of Indaziflam 200SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, percent organic matter content, application site, and crop.

When making more than one application per year, allow a minimum of 90 days between applications.

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Do not use on soils with 20% or more gravel content.

Do not apply when nuts intended for harvest are on the ground or illegal residues may result.

Do not apply more than a total of 10.3 fl oz of product (0.134 lb ai/A) per year or in a 12 month period when used in Pome Fruit, Stone Fruit, Tree Nuts, and crops in the Proposed Crop Subgroup 23A; Small Fruit, Edible Peel Subgroup, including Olive.

In the California counties of Kern, Inyo, Tulare, Kings, Fresno, and Madera Indaziflam 200SC Herbicide can only be applied beginning after harvest up to initiation of pink bud stage in almonds, and up to beginning emergence of green leaf tissue in pistachios, walnuts, and pecans.

APPLICATION DIRECTIONS FOR REPLANTED LABELED CROPS IN ESTABLISHED BLUEBERRY (HIGHBUSH) AND OTHER BUSHBERRY SUBGROUP CROPS IN 13-07B EXCEPT BLUEBERRY (LOWBUSH); CANEBERRY AND OTHER CANEBERRY SUBGROUP CROPS IN 13-07A; COFFEE; FRUIT, SMALL, VINE CLIMBING, EXCEPT FUZZY KIWIFRUIT SUBGROUP 13-07F; HOPS; POME AND STONE FRUIT; SMALL FRUIT, EDIBLE PEEL SUBGROUP, INCLUDING OLIVE ORCHARDS; TREE NUT, AND CROPS IN THE PROPOSED CROP SUBGROUP 23A.

Indaziflam 200SC Herbicide may be used in established orchards/groves/vineyards around new trees or vines (resets/replants) anytime following planting provided the following conditions exist:

1. The soil is completely settled around established and newly planted trees/vines and there are not open channels or depressions in the soil that would allow the product to move into the root zone through open channels.
2. The trunks are protected from spray contact by nonporous wraps, grow tubes, or waxed containers.
3. The trees/vines are exhibiting good health and vigor.
4. Indaziflam 200SC Herbicide can be applied to resets/replants contained within 3 year old and older established grapes, pome and stone fruit, pecan and olive.

Blueberry (highbush) and other bushberry subgroup crops in 13-07B: Aronia berry; blueberry, highbush; buffalo currant; Chilean guava; cranberry, highbush; currant, black; currant, red; elderberry; European barberry; gooseberry; honeysuckle, edible; huckleberry; jostaberry; Juneberry (Saskatoon berry); lingonberry; native currant; salal; sea buckthorn; cultivars, varieties, and/or hybrids of these including rabbiteye blueberries, except blueberry (lowbush).

Caneberry and other caneberry subgroup crops in 13-07A: Blackberry; loganberry; raspberry, black and red; wild raspberry; cultivars, varieties, and/or hybrids of these.

Coffee

Fruit, Small, Vine Climbing, Except Fuzzy Kiwifruit Subgroup 13-07F including: Amur river grape; gooseberry; grape; kiwifruit, hardy; maypop; schisandra berry; cultivars, varieties, and/or hybrids of these.

Hops

Pome Fruit Crop group 11 including: apple; azarole; crabapple; loquat; mayhaw; medlar; pear; pear, Asian; quince; quince, Chinese; quince, Japanese; tejocote; cultivars, varieties, and/or hybrids of these.

Stone Fruit Group 12-12 including: Apricot; apricot, Japanese; capulin; cherry, black; cherry, Nanking; cherry, sweet; cherry, tart; Jujube, Chinese; nectarine; peach; plum; plum, American; plum, beach; plum, Canada; plum, cherry; plum, Chickasaw; plum, Damson; plum, Japanese; plum, Klamath; plum, prune; plumcot; sloe; cultivars, varieties, and/or hybrids of these.

Crops in the proposed Crop Subgroup 23A: Small fruit, edible peel subgroup including: Acerola; African plum; agritos, almondette; appleberry; arbutus berry; bayberry, red; bignay; breadnut; cabeluda; carandas-plum; Ceylon iron wood; Ceylon olive; cherry-of-the-Rio-Grande; Chinese olive, black; Chinese olive, white; chirauli-nut; cocoplum; desert-date; false sandalwood; fragrant manjack; gooseberry, Abyssinian; gooseberry, Ceylon; gooseberry, otaheite; governor's plum; grumichama; guabiroba; guava berry; guava, Brazilian; guava, Costa Rican; guayabillo; illawarra plum; Indian-plum; Jamaica-cherry; jambolan; kaffir-plum; kakadu plum; kapundung; karnada; lemon aspen; mombin, yellow; monos plum; mountain cherry; olive; persimmon, black; pitomba; plum-of-Martinique; rukam; rumberry; sea grape; sete-capotes; silver aspen; water apple; water pear; water berry; wax jambu.

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Tree Nuts: Crop group 14-12 including: African nut-tree; almond; beechnut; Brazil nut; Brazilian pine; bunya; bur oak; butternut; Cajou nut; candlenut; cashew; chestnut; chinquapin; coconut; coquito nut; dika nut; ginkgo; Guiana chestnut; hazelnut (filbert); heartnut; hickory nut; Japanese horse-chestnut; macadamia nut; mongongo nut; monkey-pot; monkey puzzle nut; Okari nut; Pachira nut; peach palm nut; pecan; pequi; Pili nut; pine nut; pistachio; Sapucaia nut; tropical almond; walnut, black; walnut, English; yellowhorn; cultivars, varieties, and/or hybrids of these.

Spot spraying is not allowed. Application is made with broadcast equipment delivering a uniform spray pattern.
Avoid direct or indirect spray contact with crop foliage, green bark, roots, or fruit as it may cause localized crop injury or death. Non-protected trunks of reset/replant trees/vines in an established orchard/vineyard planted more than one year may be sprayed with Indaziflam 200SC Herbicide if the trunk is callused, mature brown bark. Contact of Indaziflam 200SC Herbicide with tissues other than mature brown bark can result in serious damage or plant death. If cracks in the soil or depressions are present after planting, fill them in prior to applying Indaziflam 200SC Herbicide.

An established tree nut orchard, except Pecan, is defined as the majority of trees in the orchard established a minimum of one year. Established Pome and Stone Fruit, Pecan, and crops in the Proposed Crop Subgroup 23A; Small Fruit, Edible Peel Subgroup, including Olive orchards and grape vineyards are defined as the majority of trees/vines in the orchard/grove/vineyard established a minimum of three years.

Labeled crops may be planted anytime following an application of Indaziflam 200SC Herbicide if the treated soil is removed from the transplant hole and soil that has not received any application of Indaziflam 200SC Herbicide within the last 12 months is used around the roots of the new transplant.

APPLICATION DIRECTIONS FOR USE IN FARMSTEAD AREAS

Indaziflam 200SC Herbicide will provide preemergence weed control around farmstead building foundations, non-paved farm roads and driveways, farm equipment lots, ungrazed fences, and shelter belts (windbreaks) around cropland when applied according to the directions found on this label.

Refer to the APPLICATION INFORMATION section of this label for application instructions and a list of the weeds that Indaziflam 200SC Herbicide will control. Apply Indaziflam 200SC Herbicide in a uniform broadcast spray as described in the APPLICATION INFORMATION section of this label. Apply as a directed spray when using under and around desired trees or shrubs such as in a shelterbelt once they are well established and the soil has finished settling. Apply 5.0 fl oz/A for coarse and medium textured soil or 5 to 6.5 fl oz/A for fine textured soil in a minimum spray volume of 10 gallons per acre in a single application. Do not exceed 6.8 fl oz/A of this product (0.088 lb ai/acre) per year or in a 12 month period for any site. For small sprayers mix 0.1 fl oz per gallon water to be applied to 1,000 square feet. Avoid direct or indirect spray contact with foliage, green bark, and roots of desired plants as it may cause plant injury or death.

Indaziflam 200SC Herbicide will not control weeds that are already emerged. For postemergence control of weeds, refer to the Tank Mix Instructions section of this label and follow the Mixing Instructions provided. Only use products that are also registered for the specific use where the application of the mixture is intended. When tank mixing products with different restrictions, follow the directions of the most restricted label.

Do not use Indaziflam 200SC Herbicide in farmstead areas on Long Island, NY.

Appendix 1

ORNAMENTALS, CHRISTMAS TREES, AND CONIFER PLANTATIONS

Indaziflam 200SC Herbicide may be applied for pre-emergent weed control in landscape ornamentals, hedgerows, production ornamentals in outdoor nurseries, shade houses, hoop houses, Christmas trees, and conifer plantations. Apply Indaziflam 200SC Herbicide as a directed spray, prior to weed seed germination to the soil surface around dormant or actively growing ornamentals/ Christmas trees/conifer plantations as listed in the table below. Apply Indaziflam 200SC Herbicide to established ornamentals/Christmas trees/conifer plantations. If the grower is uncertain about ornamental/ Christmas trees/conifer plantations establishment after transplanting, wait 2 months before applying Indaziflam 200SC Herbicide.

USE RESTRICTIONS FOR INDAZIFLAM 200SC HERBICIDE ON LANDSCAPE AND PRODUCTION ORNAMENTALS, CHRISTMAS TREES, AND CONIFERS

- Do not exceed the maximum single application rates specified under each Ornamental use.
- Do not exceed a total of 6.8 fl oz (0.088 lb ai/acre) of Indaziflam 200SC Herbicide per acre in a 12 month period.
- Do not allow spray to contact foliage. Indaziflam 200SC Herbicide may cause localized injury to the foliage, especially young leaf tissue. If the spray should contact the foliage, remove affected foliage or wash off immediately.
- Do not use Indaziflam 200SC Herbicide around bedding plants (annuals and herbaceous plants not specified, or not listed as tolerant on this label) or in areas where bedding plants may be planted or seeded for a minimum of one year after application of Indaziflam 200SC Herbicide to a landscape bed.
- Do not use Indaziflam 200SC Herbicide around bearing fruit and nut trees.
- Do not use Indaziflam 200SC Herbicide around non-bearing fruit trees unless they are at least 1 year old (citrus) and 3 years old (all others). Non-bearing trees are defined as trees that will not bear fruit until at least 1 year after treatment.
- Do not use Indaziflam 200SC Herbicide within the drip line of bearing fruit and nut trees.
- Do not mix Indaziflam 200SC Herbicide into the soil. Cultivating or disturbing the soil surface after application may reduce weed control activity.
- Avoid applying Indaziflam 200SC Herbicide to heavily mulched landscape beds, as reduced weed control may occur. For best results remove existing mulch and replace mulch after an application of Indaziflam 200SC Herbicide.
- If transplanting mature plants listed as tolerant on this label into soil treated with Indaziflam 200SC Herbicide within the preceding 12 months, discard existing soil from the planting hole and add new soil around roots to minimize effects on plant establishment.
- Do not use Indaziflam 200SC Herbicide on ornamentals being grown in a greenhouse.
- Do not use Indaziflam 200SC Herbicide on nursery seedbeds, rooted cuttings or young plants in liners.
- Do not apply Indaziflam 200SC Herbicide to ornamentals growing in containers except pot-in-pot ornamentals.
- Do not apply Indaziflam 200SC Herbicide to ornamental bulbs in production fields.
- Do not apply Indaziflam 200SC Herbicide to ornamental bulbs in landscapes, commercial fields, or residential sites after they have emerged.
- Do not apply Indaziflam 200SC Herbicide to herbaceous perennials (e.g. hosta) after they have emerged.
- Do not apply Indaziflam 200SC Herbicide over-the-top of ornamentals/ Christmas trees/conifer plantations.
- Do not apply Indaziflam 200SC Herbicide to budded grafts or graft unions as this could cause plant injury or death.
- Do not apply Indaziflam 200SC Herbicide by air.

USE OF INDAZIFLAM 200SC HERBICIDE ON ORNAMENTALS/ CHRISTMAS TREES/CONIFER PLANTATIONS IN COARSE AND SANDY SOILS

Soil conditions can affect the tolerance of ornamentals/ Christmas trees/conifer plantations to Indaziflam 200SC Herbicide. Excessively coarse or sandy soils may allow for downward movement of Indaziflam 200SC Herbicide into the root zone and cause significant root damage and phytotoxicity. Coarse soils, for example, may include significant quantities of sand, gravel, decomposed granite, and ground cinders. Prior to application of Indaziflam 200SC Herbicide on these soils, confirm soil texture with a soil test. Ornamentals/ Christmas trees/conifer plantations grown in soil exceeding 80% sand or 20% gravel may be at risk. If Indaziflam 200SC Herbicide is to be applied in these soils, evaluate tolerance of a few plants of each ornamental/ Christmas trees/conifer plantations in Indaziflam 200SC Herbicide treated soil for 2 to 3 months prior to a large scale application.

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SYMPTOMS OF INDAZIFLAM 200SC HERBICIDE INJURY ON ORNAMENTALS

Indaziflam 200SC Herbicide may injure sensitive ornamentals by damaging roots or leaves. Plant foliage damaged by root absorption will appear stunted, deformed, and may not recover. If Indaziflam 200SC Herbicide is allowed to contact leaves, leaf symptoms including leaf spot, leaf discoloration, and leaf curl may appear. Symptoms appear within several days after application. Leaves formed after appearance of symptoms may recover.

Users must assess the severity of any symptoms on cultivars not listed on this label, before proceeding with large-scale applications of Indaziflam 200SC Herbicide. The user assumes all responsibility for damage on cultivars not listed on this label.

LANDSCAPE ORNAMENTAL USES

Indaziflam 200SC Herbicide may be used in residential, commercial, as well as federal, state and local plantings of ornamentals and hedgerows for pre-emergent weed control. Indaziflam 200SC Herbicide should be applied as a directed spray only to established (rooted) plants and not to newly rooted cuttings or seedlings. To avoid root damage, apply Indaziflam 200SC Herbicide around transplants when the soil has firmly settled around the root area. Irrigation or rainfall will help to settle the soil and seal surface cracks. Make applications prior to mulching for best weed control. If Indaziflam 200SC Herbicide should contact foliage, wash off immediately to avoid damage. Herbaceous annuals and perennials are sensitive to Indaziflam 200SC Herbicide. Applications of Indaziflam 200SC Herbicide should only be made to ornamentals listed on this label.

AMOUNT TO USE: Apply Indaziflam 200SC Herbicide as a broadcast, directed spray at 2.2 to 4.4 fl oz/acre around ornamentals.

To activate Indaziflam 200SC Herbicide for maximum herbicidal benefit, irrigate the area treated with Indaziflam 200SC Herbicide to move the herbicide into the soil within several days after application. With dry soil, use a minimum of 0.25 inches of irrigation water, and with soil at or greater than field capacity; the amount of irrigation water should be reduced. In either case, do not create conditions that cause visible run-off of irrigation water. Adequate rainfall following an application will negate the need for irrigation.

A subsequent application of Indaziflam 200SC Herbicide can be made within 90 days after the initial application to extend weed control provided that the maximum allowed rate does not exceed 6.8 fl oz (0.088 lb ai/acre) of this product per acre in a (0.088 lb ai/acre) 12 month period.

COMBINATIONS OF INDAZIFLAM 200SC HERBICIDE WITH NON-SELECTIVE HERBICIDES AROUND ORNAMENTALS

Remove existing weed growth before application of Indaziflam 200SC Herbicide or use a post-emergence herbicide labeled for control. Indaziflam 200SC Herbicide may be used in combination with a non-selective herbicide. Avoid contact of spray containing a non-selective herbicide with foliage, stems, green bark, or bare roots of turf grasses, trees, shrubs, or other desirable vegetation, since severe damage may result. If spraying areas adjacent to desirable plants with a non-selective herbicide, use a shield while spraying to help prevent spray from contacting foliage of desirable plants.

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

PRODUCTION ORNAMENTAL USES

Indaziflam 200SC Herbicide provides up to 8 months of weed control with a single application. The exact length of control depends on many environmental factors as well as the weeds to be controlled and the weed pressure. Apply Indaziflam 200SC Herbicide as a directed spray to the soil surface only to established (rooted) plants in the soil or in pots and not to newly rooted cuttings/or seedling beds in production nurseries. Do not apply Indaziflam 200SC Herbicide to newly rooted cuttings/or seedling beds. To avoid root damage, apply Indaziflam 200SC Herbicide around transplants when the plant is well established and the soil has firmly settled around the root area. Irrigation or rainfall will help to settle the soil and seal surface cracks. Apply Indaziflam 200SC Herbicide around dormant plants. If applied after dormancy, care should be taken not to contact expanding buds or new leaves. Applications of Indaziflam 200SC Herbicide should only be made to ornamentals listed on this label. Indaziflam 200SC Herbicide should be applied to soil free of weeds, debris, and soil clods for optimum efficacy. Herbicidal efficacy may be reduced if soil is disturbed after application.

Application of Indaziflam 200SC Herbicide to deciduous foliage or green bark may result in unacceptable injury. Apply Indaziflam 200SC Herbicide to established ornamentals. If the grower is uncertain about ornamental establishment after transplanting, wait 2 months before applying Indaziflam 200SC Herbicide.

AMOUNT TO USE: Apply Indaziflam 200SC Herbicide as a broadcast, directed spray at 2.8 to 6.8 fl oz (0.088 lb ai/acre) of Indaziflam 200SC Herbicide per acre (0.06 to 0.13 fl oz per 1,000 sq ft) around ornamentals in 20 to 100 gallons of water per acre (0.5 to 2.3 gallons of water per 1,000 sq ft).

To activate Indaziflam 200SC Herbicide for maximum herbicidal benefit, irrigate the area treated with Indaziflam 200SC Herbicide to move the herbicide into the soil within 21 days after application. With dry soil, use a minimum of 0.125 to 0.25 inches of irrigation water.

With soil at or greater than field capacity, reduce the amount of irrigation water. In either case, do not create conditions that cause visible run-off of irrigation water. Adequate rainfall following an application will negate the need for irrigation.

A subsequent application of Indaziflam 200SC Herbicide can be made within 90 days after the initial application provided that the maximum allowed rate does not exceed 6.8 fl oz (0.088 lb ai/acre) Indaziflam 200SC Herbicide (0.088 lb ai/acre) per acre in a 12-month period.

Do not apply Indaziflam 200SC Herbicide to plant types not listed as tolerant on this label. Indaziflam 200SC Herbicide may be applied to cultivars of listed tolerant plants that are not listed on this label. Prior to large-scale applications, treat a small number of such plants at the desired use rate. Treated plants should then be evaluated 1 to 2 months after application for possible injury and acceptable tolerance.

IMPORTANT: Direct application of Indaziflam 200SC Herbicide to the soil surface and away from plant foliage and bark. Avoid direct spray contact on plant surfaces, foliage, and green bark or injury may result. Application of Indaziflam 200SC Herbicide after bud swell may cause injury if herbicide contacts foliage. Avoid application under environmental conditions that favor drift to non-targeted areas. Deep cultivation reduces the effectiveness of Indaziflam 200SC Herbicide and should be avoided.

COMBINATIONS OF INDAZIFLAM 200SC HERBICIDE WITH NON SELECTIVE HERBICIDES AROUND ORNAMENTALS

Remove existing weed growth before application of Indaziflam 200SC Herbicide or use a post-emergence herbicide labeled for control. Indaziflam 200SC Herbicide may be used in combination with a non-selective herbicide. Avoid contact of spray containing a non-selective herbicide with foliage, stems, green bark, or bare roots of turf grasses, trees, shrubs, or other desirable vegetation, since severe damage may result. If spraying areas adjacent to desirable plants with a non-selective herbicide, use a shield while spraying to help prevent spray from contacting foliage of desirable plants.

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

ORNAMENTALS AND THEIR CULTIVARS TOLERANT TO INDAZIFLAM 200SC HERBICIDE

Tolerant ornamentals and their cultivars are listed in the following table. Apply as a directed spray around tolerant ornamentals. If a cultivar to be treated is not listed on this label, treat several plants of the cultivar at the single maximum desired use rate and evaluate 1 to 2 months later for possible injury and acceptable tolerance. The user assumes responsibility for application on plants not listed in this table.

Common Name	Scientific Name	Cultivar
Abelia	*Abelia grandiflora*	
Apple	*Malus sp.*	(non-bearing)
Apple	*Malus domestica*	Haralred (non-bearing)
Arborvitae	*Thuja occidentalis*	Nigra
Arborvitae	*Thuja occidentalis*	Techny
Arborvitae	*Thuja occidentalis*	Green Giant
Asparagus Fern	*Asparagus plumosus*	
Aspen, Quaking	*Populus tremuloides*	
Azalea	*Rhododendron sp.*	Girard's Rose
Azalea	*Rhododendron sp.*	Fashion
Azalea	*Rhododendron sp.*	VF 14
Azalea	*Rhododendron sp.*	Golden Torch
Azalea, Encore	*Rhododendron sp.*	Autumn Debutante
Bald Cypress	*Taxodium distichum*	
Bamboo, Golden	*Phyllostachys aurea*	
Barberry	*Berberis sp.*	
Birch	*Betula populifolia*	Whitespire
Birch, River	*Betula nigra*	Heritage
Birch, River	*Betula nigra*	
Black Tupelo	*Nyssa sylvatica*	Wild Fire
Bluebird	*Caryopteris x clandonensis*	Dark Knight
Boxwood	*Buxus microphylla*	Green Beauty
Boxwood	*Buxus microphylla*	Chicagoland Green
Boxwood	*Buxus microphylla*	Baby Gem
Boxwood	*Buxus microphylla*	Wintergreen

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Butterfly Bush	*Buddleia*	Nanho Blue
Camellia	*Camellia japonica*	Margaret Heathcliff Pink
Camellia	*Camellia sasanqua*	Cleopatra Pink
Catalpa, Southern	*Catalpa bignoniaceae*	
Cedar, Atlantic white	*Chamaecyparis sp.*	
Cedar, Eastern Red	*Juniperus virginiana*	
Cedar, Japanese	*Cryptomeria japonica*	Black Dragon
Cedar, Japanese	*Cryptomeria japonica*	Burkii
Cedar, Japanese	*Cryptomeria japonica*	Yoshino
Cherry, American Plum	*Prunus americana*	
Cherry, Okame	*Prunus x incamp*	
Cherry,	*Prunus serrulata*	Kwanzan
Cherry, Purple Leaf Sand	*Prunus cistena*	
Cherry, Sargent	*Prunus sargentii*	Spring Wonder
Cherry, Yoshino	*Prunus x yedoensis*	Yoshino
Chokeberry	*Aronia sp.*	
Cotoneaster	*Cotoneaster dammeri*	Coral Beauty
Cottonwood	*Populus deltoides*	Sioux
Crabapple	*Malus x 'Harvest Gold'*	
Crabapple	*Malus x 'Snowdrift'*	
Crabapple	*Malus coronaria*	
Crape Myrtle	*Lagerstroemia indica x fauriei*	Muskogee
Crape Myrtle	*Lagerstroemia x 'Miami'*	
Crape Myrtle	*Lagerstroemia indica x fauriei*	Tuscarora
Cotoneaster	*Cotoneaster*	Coral Beauty
Cypress, false	*Chamaecyparis sp.*	Gold Mops
Cypress, Mediterranean	*Cupressus sempervirens*	
Cypress, Leyland	*Cupressus x leylandii*	
Daphne	*Daphne caucasica*	Summer Ice
Dawn Redwood,	*Metasequoia glyptostroboides*	
Day-lily (before unfurling)	*Hemerocallis sp.*	Green Flutter
Day-lily (before unfurling)	*Hemerocallis sp.*	Stella d'Oro
Dogwood, Kousa	*Cornus kousa*	Kousa
Elm, American	*Ulmus americana*	
Elm, Bosque	*Ulmus parvifolia*	
Eucalyptus, Silver Dollar Gum	*Eucalyptus polyanthemos*	
Euonymus,	*Euonymus alatus*	Compacta
Fir,	*Abies fraseri*	
Florida Pipestem	*Leucothoe populifolia*	
Forsythia	*Forsythia*	Lynwood
Forsythia	*Forsythia sp.*	Golden Bells
Fragrant tea olive	*Osmanthus fragrans*	
Gardenia	*Gardenia radicans*	Radicans
Gardenia	*Gardenia jasminoides*	Mystery
Gardenia	*Gardenia jasminoides*	Frostproof
Gaura	*Gaura lindheimeri*	Pink Fountain
Gold-Dust Plant	*Aucuba japonica*	Gold Dust
Green Ash	*Fraxinus pennsylvanica*	
Green Ash	*Fraxinus pennsylvanica*	Georgia Gem
Hardy Kiwi	*Actinidia arguta*	Anna
Hawthorn, Thornless	*Crataegus crus-galli*	Inermis
Hibiscus, Chinese	*Hibiscus rosa-sinensis*	San Diego Red
Holly,	*Ilex x aquip*	
Holly,	*Ilex x attenuata*	East Palatka
Holly, Chinese	*Ilex cornuta*	Needlepoint
Holly, Foster	*Ilex x attenuata*	Fosteri
Holly, Gallberry	*Ilex glabra*	Densa
Holly, Meservae	*Ilex meservae*	Blue Princess
Holly, Nellie R. Stevens	*Ilex*	Nellie R. Stevens
Holly, American	*Ilex opaca*	
Holly,	*Ilex verticillata*	Jim Dandy

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Holly,	*Ilex verticillata*	Red Sprite
Holly, Japanese	*Ilex crenata*	Sky Pencil
Honeylocust,	*Gleditsia tricanthos*	Sunburst
Honeylocust,	*Gleditsia tricanthos*	Skyline
Indian Hawthorn	*Raphiolepsis indica*	Pink Lady
Japanese Cleyera	*Ternstromia gymnanthera*	
Japanese Mock-orange	*Pittosporum tobira*	Variegata
Jasmine, Asiatic/Yellow Star	*Trachelospermum asiaticum*	
Jasmine, winter	*Jasminum nudiflorum*	
Juniper, Bar Harbour	*Juniperus horizontalis*	Bar Harbour
Juniper, Blue Pacific	*Juniperus conferta*	Blue Pacific
Juniper, Blue Rug	*Juniperus horizontalis*	Blue Rug
Juniper, Brodie	*Juniperus virginiana*	
Juniper, Spartan	*Juniperus chinensis*	Spartan
Lantana	*Lantana camara*	Landmark Sunrise Rose
Lilac	*Syringa x 'Penda'*	Bloomerang
London Plane Tree,	*Plantanus acerifolia*	
Loropetalum	*Loropetalum chinensis*	Burgundy
Loropetalum	*Loropetalum chinensis*	Ruby
Magnolia,	*Magnolia grandiflora*	Bracken Brown Beauty'
Magnolia,	*Magnolia grandiflora*	Little Gem
Magnolia, Jane	*Magnolia liliflora 'Nigra' x M. stellata*	Rosea
Maple, Autumn Blaze	*Acer freemanii*	Jeffersred
Maple, red	*Acer rubrum*	
Maple, Red	*Acer rubrum*	Red Sunset
Maple, Red	*Acer rubrum*	October Glory
Maple, Silver	*Acer saccharinum*	
Maple, Sugar	*Acer saccharum*	
Maple, Sugar	*Acer saccharum*	Commemoration
Nandina	*Nandina domestica.*	Firepower
Ninebark,	*Physocarpus opulifolius*	Summer Wine
Oak, Southern Live	*Quercus virginiana*	
Oak, Cathedral Live	*Quercus virginiana*	SDLN
Oak, Northern Red	*Quercus rubra*	
Oak, Nuttal	*Quercus nuttallii*	
Oak, Shumard	*Quercus shumardii*	
Ohio Buckeye,	*Aesculus glabra*	
Palm, Areca	*Dypsis lutescens*	
Palm, Manila	*Adonidia merrillii*	
Palm, Alexander	*Archontophoenix alexandre*	
Palm, Florida Thatch	*Thrinax radiate*	
Palm, Spindle	*Hyophorbe verschaffeltii*	
Pear, Callery	*Pyrus calleryana*	Chanticleer
Pear, Callery	*Pyrus calleryana*	Bradford
Pieris,	*Pieris japonica*	Shojo
Pine, Canary Island	*Pinus canariensis*	
Pine, Eastern White	*Pinus strobus*	
Pine, Scotch	*Pinus sylvestrus*	
Pistache, Texas	*Pistacia texana*	
Plum, Crimson Pointe	*Prunus x cerasifera*	Cipriozam
Podocarpus	*Podocarpus macrophyllus*	
Privet,	*Ligustrum sp.*	
Redbud, Eastern	*Cercis canadensis*	MN Strain
Redbud,	*Cercis reniformis*	Oklahoma
Rhododendron,	*Rhododendron x crete*	
Rose,	*Rosa wichurana*	Dr. Huey
Rose	*Rosa sp.*	Pink Knock Out®
Rose	*Rosa sp.*	Knock Out®
Rose, Virginia	*Rosa virginiana*	
Rose Mallow	*Hibiscus moscheutos*	
Rose of Sharon	*Hibiscus syriacus*	Pink Heart
Rose of Sharon	*Hibiscus syriacus*	Boule de Feu

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Russian Sage	*Perovskia atriplicifolia*	
Skip Laurel,	*Prunus laurocerasis*	
Snowberry, common	*Smyphoricarpos albus*	
Spicebush,	*Lindera benzoin*	
Spruce, Blackhills	*Picea glauca*	
Spruce, Norway	*Picea abies*	
Tamarisk,	*Tamarix ramosissima*	Pink Cascade
Taxus (Yew)	*Taxus cuspidata*	Capitada
Thin-fruit Sedge	*Carex flaccosperma*	
Viburnum, Burkwood	*Viburnum x burkwoodii*	
Virbunum	*Virbunum lantana*	Mohican
Viburnum, popcorn	*Viburnum plicatum*	Popcorn
Wax myrtle, southern	*Myrica cerifera*	
Weigelia, variegated	*Weigelia variegate*	

Do not use Indaziflam 200SC Herbicide on any of these plants, as injury will occur.

Common Name	**Scientific Name**
Blue Fescue Grass	*Festuca glauca*
Columbine	*Aquilegia canadensis*
Coneflower	*Echinacea purpurea*
Croton	*Codiaeum variegatum*
Dianthus	*Dianthus sp.*
Euonymus, Japanese	*Euonymus japonicus*
Fountain Grass	*Pennisetum alopecuroides*
Fountain Grass, purple	*Pennisetum setaceum*
Golden Dewdrops	*Duranta erecta*
Hydrangea	*Hydrangea macrophylla*
Ixora	*Ixora coccinea*
Lavender, Munstead	*Lavandula angustifolia*
Lilyturf	*Liriope sp.*
Mint	*Mentha sp.*
Mondo Grass	*Ophiopogon japonicus*
Muhlygrass	*Muhlenbergia capillaries*
Plumbago	*Plumbago spp.*
Sage	*Salvia spp*
Sweet Viburnum	*Viburnum odoratissimum*
Tickseed, Dwarf mouse-ear	*Coreopsis auriculata*
Weigela	*Weigela spp.*

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CONIFERS AND CHRISTMAS TREES

Indaziflam 200SC Herbicide may be used for pre-emergence weed control in conifer nurseries and Christmas tree farms. Indaziflam 200SC Herbicide may be applied as a directed spray to soil surrounding established plants. Avoid contacting plant stems and leaves with the directed spray solution as injury may occur. Established plants are transplants that are actively growing and where the soil has settled. Do not apply to seedlings or seedling beds. Apply 2.8-5.8 fl oz of Indaziflam 200SC Herbicide per acre for these uses. Do not exceed 6.8 fl oz (0.088 lb ai/acre) of Indaziflam 200SC Herbicide per acre in a growing season.

Indaziflam 200SC Herbicide may be tank-mixed with products containing the following active ingredients labeled for use in conifers: glyphosate or glufosinate. Do not apply tank-mixes of Indaziflam 200SC Herbicide with these active ingredients to conifer and Christmas tree foliage. Follow use restrictions on all labels.

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

SPRAYER CLEANUP PROCEDURE

Before and after using Indaziflam 200SC Herbicide, thoroughly clean all mixing and spray equipment, including tanks, pumps, lines, filters, screens, and nozzles with a good quality tank cleaner on an approved rinse pad or on the field site where an approved crop is being grown. Clean sprayer thoroughly after each use and before Indaziflam 200SC Herbicide residue dries in the equipment. Proper PPE must be worn while cleaning.

1. Completely drain all remaining spray solution from the tank in an appropriate location.
2. Clean the sprayer using a commercially available tank cleaner following the use instructions provided by the manufacturer. A rotating cleaning nozzle may be beneficial to dislodge any product from the sides of the tank.
3. Drain all cleaning solution from the tank and lines in an appropriate location.
4. Rinse the tank and flush spray booms with clean water to remove the cleaning solution.
5. Remove, clean, and inspect filters, screens, nozzles, and boom end caps if equipped to ensure that no product remains.
6. Rinse the inside and outside of the spray tank and all lines once more with clean water.
7. Drain all rinse solution in an appropriate location.

If any Indaziflam 200SC Herbicide is left in the spray equipment and subsequently applied to another crop, it has the potential to cause injury to that crop.

ROTATIONAL CROP RESTRICTIONS

Indaziflam 200SC Herbicide is intended for use in perennial tree and vine crops listed in this label and for non-crop farmstead uses. Do not rotate to any crops not listed on this label within 24 months after the last application. Planting earlier than this may result in crop injury or death. If a crop is not on this label, a bioassay should be conducted prior to planting if Indaziflam 200SC Herbicide has been used in the previous 36 months. A successful field bioassay means growing a test strip or several plots of the intended crop from seed or transplant to maturity without any observed herbicide symptoms. The test should be conducted in representative areas across the field that includes knolls, low areas, field edges, and changes in soil texture. The rotational crop interval must be extended if the field bioassay does not result in acceptable crop tolerance.

Labeled citrus crops may be transplanted into soil previously treated with Indaziflam 200SC Herbicide 1 month or more after the last application provided potted trees (such as citripots) are used.

New orchards of labeled pome and stone fruit, tree nut, and olive may be established in a location previously treated with Indaziflam 200SC Herbicide 1 year after application. Grape vineyards may be established in a location previously treated with Indaziflam 200SC Herbicide 2 years after application. In labeled pome and stone fruit, tree nuts, grapes, and olive previously treated soil must be thoroughly mixed to a depth of at least 6 inches prior to planting. This may be done through any combination of tillage operations such as ripping, disking, or plowing.

If other herbicides have also been used, follow the most restrictive label for the crop rotation interval.

RESISTANCE MANAGEMENT

Indaziflam, the active ingredient in this product, is a Group 29 herbicide based on the mode of action classification system of the Weed Science Society of America. A given weed population may contain plants naturally resistant to Group 29 herbicides. Such resistant weed plants may not be effectively managed using Group 29 herbicides but may be effectively managed using another herbicide alone or in mixtures from a different Group and/or by using cultural or mechanical practices. However, a herbicide mode of action classification by itself may not adequately address specific weeds that are resistant to specific herbicides. Consult your local company representative, state cooperative extension service, professional consultants, or other qualified authorities to determine appropriate actions for treating specific resistant weeds.

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Best Management Practices
Proactively implementing diversified weed control strategies to minimize selection for weed populations resistant to herbicides is recommended. A diversified weed management program may include the use of multiple herbicides with different modes of action with overlapping weed control spectrum, tillage operations and/or other cultural practices that control weeds. Research has demonstrated that using the labeled rate and directions for use is important to delay the selection for resistance. Scouting after a herbicide application is important because it can facilitate the early identification of weed shifts and/or weed resistance and thus provide direction on future weed management practices. One of the best ways to contain resistant populations is to implement measures to avoid allowing weeds to reproduce by seed or to proliferate vegetatively. Cleaning equipment between sites and avoiding movement of plant material between sites will greatly aid in retarding the spread of resistant weed seed.

There are no known cases of weed resistance to Indaziflam 200SC Herbicide or any known instances of cross-resistance between Indaziflam 200SC Herbicide and other classes of herbicides or modes of action. Research has shown that performance of Indaziflam 200SC Herbicide is not affected by the presence of biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action.

To delay the development of herbicide resistance, the following practices are recommended:

- Use herbicides with different modes of action in the tank mixture, rotation, or in conjunction with alternate cultural practices.
- Always use at least the minimum rate specified by the label and observe all use rate instructions.
- Avoid the consecutive use of Indaziflam 200SC Herbicide unless another herbicide that is effective on the same target weeds is used in rotation or as a tankmix partner.
- Base herbicide use on a comprehensive Integrated Pest Management (IPM) program.
- Monitor treated areas and control escaped weeds by alternate means.
- Contact local extension or crop advisor for IPM and resistance management information.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Protect the product from freezing temperatures. Store the product at temperatures above 32℉ and prefe rably above 40℉.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER HANDLING

Rigid, Non-refillable containers small enough to shake (i.e., with capacities equal to or less than 5 gallons)

Non-refillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Offer for recycling, if available or reconditioning, if appropriate. Then puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities.

Rigid, Non-refillable containers (greater than 5 gallons or 50 lbs)

Non-refillable Containers

Non-refillable containers - Do not reuse or refill this container. Refer to Bottom Discharge IBC or Top Discharge IBC, Drums, Kegs information as follows.

Bottom Discharge IBC (e.g. – Schuetz Caged IBC or Snyder Square Stackable)

Pressure rinsing the container before final disposal is the responsibility of the person disposing of the container. To pressure rinse the container before final disposal, empty the remaining contents from the IBC into application equipment or mix tank. Raise the bottom of the IBC by 1.5 inches on the side which is opposite of the bottom discharge valve to promote more complete product removal. Completely remove the top lid of the IBC. Use water pressurized to at least 40 PSI to rinse all interior portions. Continuously pump or drain rinsate into application equipment or rinsate collection system while pressure rinsing. Continue pressure rinsing for 2 minutes or until rinsate becomes clear. Replace the lid and close bottom valve.

Top Discharge IBC, Drums, Kegs (e.g.– Snyder 120 Next Gen, Bonar B120, Drums, Kegs).

Appendix 1

Triple rinsing the container before final disposal is the responsibility of the person disposing of the container. To triple rinse the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container at least 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Rinse all interior surfaces. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this procedure two more times.

Once container is rinsed, offer for recycling if available or puncture and dispose of in a sanitary landfill.

Refillable Containers

Refillable container – Refer to Bottom Discharge IBC or Top Discharge IBC, Drums, Kegs information as follows. Refill this container with pesticide only. Do not reuse this container for any other purpose. Contact your Ag retailer or Bayer CropScience for container return, disposal and recycling information.

Bottom Discharge IBC (e.g. – Schuetz Caged IBC or Snyder Square Stackable)

Pressure rinsing the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To pressure rinse the container before final disposal, empty the remaining contents from the IBC into application equipment or mix tank. Raise the bottom of the IBC by 1.5 inches on the side which is opposite of the bottom discharge valve to promote more complete product removal. Completely remove the top lid of the IBC. Use water pressurized to at least 40 PSI to rinse all interior portions. Continuously pump or drain rinsate into application equipment or rinsate collection system while pressure rinsing. Continue pressure rinsing for 2 minutes or until rinsate becomes clear. Replace the lid and close bottom valve.

Top Discharge IBC, Drums, Kegs (e.g.– Snyder 120 Next Gen, Bonar B120, Drums, Kegs).

Triple rinsing the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To triple rinse the containers before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container at least 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Rinse all interior surfaces. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this procedure two more times.

Once container is rinsed, offer for recycling if available or puncture and dispose of in a sanitary landfill.

End users are authorized to remove tamper evident cables as required to remove the product from the container unless the container is equipped with one way valves and refilling or returning is planned. If this is the case, end users are not authorized to remove tamper evident cables, one way valves or clean container.

Appendix 1

IMPORTANT: READ BEFORE USE

Read the entire Directions for Use, Conditions, Disclaimer of Warranties and Limitations of Liability before using this product. If terms are not acceptable, return the unopened product container at once.

By using this product, user or buyer accepts the following Conditions, Disclaimer of Warranties and Limitations of Liability.

CONDITIONS: The directions for use of this product are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application, all of which are beyond the control of Bayer CropScience LP. All such risks shall be assumed by the user or buyer.

DISCLAIMER OF WARRANTIES: TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BAYER CROPSCIENCE LP MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, THAT EXTEND BEYOND THE STATEMENTS MADE ON THIS LABEL. No agent of Bayer CropScience LP is authorized to make any warranties beyond those contained herein or to modify the warranties contained herein. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BAYER CROPSCIENCE LP DISCLAIMS ANY LIABILITY WHATSOEVER FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT.

LIMITATIONS OF LIABILITY: TO THE EXTENT CONSISTENT WITH APPLICABLE LAW THE EXCLUSIVE REMEDY OF THE USER OR BUYER FOR ANY AND ALL LOSSES, INJURIES OR DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, WHETHER IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE, SHALL NOT EXCEED THE PURCHASE PRICE PAID, OR AT BAYER CROPSCIENCE LP'S ELECTION, THE REPLACEMENT OF PRODUCT.

NET CONTENTS:

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PRODUCED FOR

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Research Triangle Park, North Carolina 27709
1-866-99BAYER (1-866-992-2937)

Indaziflam 200SC Herbicide (MASTER) 07/05/2017

Appendix 2

GROUP	29	HERBICIDE

Indaziflam 500SC Herbicide

ABN: Alion® HL

For Preemergent Weed Control in Blueberry (Highbush) and other Bushberry Subgroup Crops in 13-07B, except blueberry (Lowbush); Caneberry and other Caneberry Subgroup Crops in 13-07A; Citrus Groves; Coffee; Fruit, Small, Vine Climbing, Except Fuzzy Kiwifruit Subgroup 13-07F; Hops; Pome and Stone Fruit, Tree Nuts, Crops in the proposed Crop Subgroup 23A; Small fruit, edible peel subgroup, including Olive, Ornamentals, Christmas Trees, and Conifer Plantations.

ACTIVE INGREDIENT:

Indaziflam*	45.05%
OTHER INGREDIENTS:	54.95%
TOTAL:	**100.00%**

Contains 4.16 pounds of indaziflam per gallon.
*(CAS No: 730979-19-8)

EPA Reg. No.: 264-1105 **EPA Est. No**

KEEP OUT OF REACH OF CHILDREN

CAUTION

For MEDICAL And TRANSPORTATION Emergencies ONLY Call 24 Hours A Day 1-800-334-7577
For PRODUCT USE Information Call 1-866-99BAYER (1-866-992-2937)

[See additional precautionary statements and directions for use on label.]

FIRST AID

If on skin or clothing:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If inhaled:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. • Call a poison control center or doctor for further treatment advice.
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything to an unconscious person.
For MEDICAL Emergencies Call 24 Hours A Day 1-800-334-7577 Have the product container or label with you when calling a poison control center or doctor or going for treatment.	

Note to physician: No specific antidote is available. Treat symptomatically.

Appendix 2

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION

Harmful if swallowed, absorbed through the skin or inhaled. Avoid contact with skin, eyes, or clothing. Avoid breathing mist.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

All mixers, loaders, applicators and other handlers must wear:

- long-sleeved shirt and long pants.
- shoes plus socks.
- waterproof gloves.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

ENGINEERING CONTROLS STATEMENTS

When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

USER SAFETY RECOMMENDATIONS

Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

Users should remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change clothing.

ENVIRONMENTAL HAZARDS

This product is toxic to fish, aquatic invertebrates, and plants. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean water mark. Do not contaminate water when disposing of equipment rinsate or washwater. This product may enter water through spray drift or runoff. Follow directions for use to avoid spray drift and runoff. A level well maintained vegetative buffer strip between areas to which this product is applied and surface water features including ponds, streams, and springs will reduce the potential of this product entering water from rainfall-runoff. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours.

Surface Water Advisory: This pesticide may impact surface water quality due to runoff of rain water. This is especially true for poorly draining soils with shallow ground water. This product is classified as having high potential for reaching surface water via runoff for several months or more after application.

Ground Water Advisory: This pesticide has properties and characteristics associated with chemicals detected in ground water. This chemical may leach into ground water if used in areas where soils are permeable, particularly where the water table is shallow.

Appendix 2

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.
Read the entire label before using this product

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

SHAKE CONTAINER WELL BEFORE USING.
IN THE STATE OF NEW YORK ONLY: NOT FOR SALE, DISTRIBUTION OR USE IN NASSAU OR SUFFOLK COUNTY.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry intervals. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

Coveralls

Shoes plus socks

Chemical resistant gloves made of any waterproof material

PRODUCT INFORMATION

Indaziflam 500SC Herbicide is formulated as a suspension concentrate of indaziflam at a concentration of 4.16 pounds of active ingredient per gallon.

Indaziflam 500SC Herbicide is a preemergence herbicide for control of annual grasses and broadleaf weeds in Blueberry (Highbush) and other Bushberry Subgroup Crops in 13-07B, except blueberry (Lowbush); Caneberry and other Caneberry Subgroup Crops in 13-07A; Citrus Groves; Coffee; Fruit, Small, Vine Climbing, Except Fuzzy Kiwifruit Subgroup 13-07F; Hops; Pome and Stone Fruit, Tree Nuts, Crops in the proposed Crop Subgroup 23A; Small fruit, edible peel subgroup, including Olive, Ornamentals, Christmas Trees, and Conifer Plantations. Indaziflam 500SC Herbicide may be applied to the soil as a uniform broadcast or band application for the prevention of new weed emergence.

Indaziflam 500SC Herbicide provides preemergence, residual control of weeds. A dry soil surface at time of application and 48 hours after application is optimum for binding the active ingredient to soil particles and preventing its downward movement to the crop's roots. Moisture is needed for activation of Indaziflam 500SC Herbicide. Dry soil conditions following the initial 48-hour period after application of Indaziflam 500SC Herbicide may result in reduced weed control. Weeds that germinate prior to activation by rain or irrigation may not be controlled. If weeds have emerged, the addition of a foliar active herbicide is needed. Indaziflam 500SC Herbicide applied alone will not control weeds that are already emerged. Refer to the "Tank Mix Instructions" section.

This product controls weeds by inhibiting cellulose biosynthesis in plants. It may be applied at any time when the ground is not frozen or covered with snow. It will provide most effective residual weed control when applied to a dry soil surface followed by 48 hours without irrigation or rain, and then followed by adequate moisture from rain or an irrigation event within 21 days and prior to weed seed germination. Weed seeds and seedlings must come into contact with Indaziflam 500SC Herbicide prior to emergence to be controlled. If insufficient moisture is present, some weeds may germinate and emerge from below the treated layer of soil. Avoid using Indaziflam 500SC Herbicide in areas where soil runoff or erosion is likely to occur.

Excessive crop or weed debris present on the soil surface at the time of application may prevent a uniform distribution of the product reaching the soil and consequently may reduce weed control. Performance may be improved by removing the debris prior to applying Indaziflam 500SC Herbicide. In very dense stands of living weeds, an application of a foliar active herbicide first then followed 3-6 weeks later with the application of Indaziflam 500SC Herbicide is recommended for improved performance.

The level of weed control is dependent on many variables including soil texture, moisture, temperature, weed species present, the amount of weed seed present in the soil, and the crop canopy.

Do not apply within 25 feet of ponds, lakes, rivers, streams, wetlands, and habitat containing aquatic and semi-aquatic plants.

The Pre-Harvest Interval (PHI) is 7 days for citrus and 14 days for all other crops listed on this label.

Appendix 2

PRECAUTIONS FOR USE

- Avoid direct or indirect spray contact with crop foliage, green bark, roots or fruit as it may cause localized crop injury or death. Only trunks with callused, mature brown bark may be sprayed with Indaziflam 500SC Herbicide. If the trunks are not fully callused, mature brown bark they should not be sprayed unless protected from spray contact by nonporous wraps, grow tubes or waxed containers. Contact of Indaziflam 500SC Herbicide with tissues other than mature brown bark may result in serious damage or plant death.
- The soil surface where Indaziflam 500SC Herbicide is to be applied should not have open channels or cracks in the soil. This is to prevent the product from reaching the crop roots either through direct contact from the spray application or with water movement from rain or irrigation as this may cause crop injury. If depressions in the soil such as from settling following transplanting exist around the base of the crop, fill them in with soil prior to applying Indaziflam 500SC Herbicide. Crops that are stressed may be more sensitive to herbicide injury and should not be treated.
- Weed control activity may be reduced if the application is made to soil covered in heavy crop or weed debris that prevents a uniform distribution of the product reaching the soil. Removing the debris prior to applying Indaziflam 500SC Herbicide may improve weed control.
- Rates provided on this label are based on broadcast treatment. For banded applications reduce the broadcast rate of Indaziflam 500SC Herbicide to the proportion of the field being treated. No area of the field may be treated with more than the highest rate provided on this label regardless of the portion of the field that this represents.
- Do not use in crops that exhibit low vigor or poor health as they may be more susceptible to crop injury. Causes of reduced vigor may include such things as previous pesticide applications, excess fertilizer or salt, diseases, insects, nematodes, drought, flooding, wind damage, frost, nutrient deficiency, or mechanical damage.

RESTRICTIONS FOR USE

- Indaziflam 500SC Herbicide can only be applied in citrus trees established for a minimum of one year after transplanting and exhibiting normal growth and good vigor, or in new citrus groves one month after planting if the transplanted trees were potted plants (such as citripots) and not bare-rooted, the trunks are protected from spray contact by nonporous wraps, grow tubes or waxed containers, and the trees are actively growing and exhibiting good health and vigor.
- Indaziflam 500SC Herbicide can only be applied in labeled tree nut crops (except pecan) that have been established for a minimum of one year after transplanting and exhibiting normal growth and good vigor.
- Indaziflam 500SC Herbicide can only be applied in labeled pome and stone fruit, pecan and olive that have been established for a minimum of three years after transplanting and exhibiting normal growth and good vigor.
- Do not use on soils with 20% or more gravel content. To determine gravel content do not remove gravel from soil samples before sending the samples for soil texture analysis, and request that gravel content be included in the analysis. The gravel content (greater than 2 mm or 0.079 inches in size, US standard sieve size 10) is defined as total percent gravel by weight before conducting soil texture analysis.
- Determine soil organic matter content (%OM) of specific orchards, vineyards, and groves by having soil core samples to a minimum depth of 6 inches of soil analyzed.
- Do not apply more than the amount of Indaziflam 500SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, percent organic matter content, application site and crop.
- Allow at least 90 days between applications of Indaziflam 500SC Herbicide.
- Only use in vineyards where the grapes have at least 6 inches of soil barrier between the soil surface and the major portion of the root system.
- Indaziflam 500SC Herbicide can only be applied in grapes that have been established for a minimum of three years after transplanting and exhibiting normal growth and good vigor.
- Do not apply this product through any type of irrigation system.
- Use of spot spraying around desired plants is not allowed due to the variability of the actual application rate. Excessive application rates may result in severe crop injury or death.
- Do not apply this product by aerial application.
- Do not harvest citrus crops within 7 days after the application of Indaziflam 500SC Herbicide.
- Do not harvest crops other than citrus within 14 days after the application of Indaziflam 500SC Herbicide.
- Only crops listed on this label may be replanted or rotated within 24 months after the last application of Indaziflam 500SC Herbicide and while following the instructions listed in the "Rotational Crop Restrictions" section.
- Do not apply this product to frozen or snow covered soil.
- Do not apply this product to water-saturated soil.

- Do not flood-irrigate orchards or vineyards containing stone fruit, pome fruit, grapes, tree nuts, or olives within 60 days following application of Indaziflam 500SC Herbicide.
- Do not apply irrigation, exclusive of flood-irrigation, to treated areas within 48 hours after application.
- Do not apply within 25 feet of ponds, lakes, rivers, streams, wetlands, and habitat containing aquatic and semi-aquatic plants.
- Do not use Indaziflam 500SC Herbicide in Nassau and Suffolk Counties of New York State.

SPRAY DRIFT MANAGEMENT

Spray equipment and weather affect spray drift. Consider all factors when making application decisions. Where states have more stringent regulations, they must be observed. Avoiding spray drift is the responsibility of the applicator or grower. To reduce the potential for drift, the application equipment must be set to apply medium to large droplets (i.e., ASAE Standard 572.1) with corresponding spray pressure. Use high flow rate nozzles to apply the highest practical spray volume. With most nozzle types, narrower spray angles produce larger droplets. Follow the nozzle manufacturer's directions on pressure, orientation, spray volume, etc., in order to minimize drift and optimize coverage and control.

Wind

Avoid making applications when spray particles may be carried by air currents to areas where sensitive crops and plants are growing. Do not spray near sensitive plants if wind is gusty, below 2 mph, or in excess of 10 mph and moving in the direction of adjacent areas of sensitive crops or plants. Do not apply during temperature inversions. Always make applications when there is some air movement to determine the direction and distance of possible spray drift.

Local terrain may influence wind patterns; the applicator should be familiar with local conditions and understand how they may impact spray drift. Boom or nozzle shielding can reduce the effects of wind or air currents on drift. Verify that the shields do not interfere with uniform deposition of product prior to application.

Temperature Inversion

A surface temperature inversion (i.e., increasing temperature with increasing altitude) greatly increases the potential for drift. Avoid application when conditions are favorable to inversion. Presence of ground fog is a good indicator of a surface temperature inversion.

Sensitive Areas

Sensitive areas to Indaziflam 500SC Herbicide are defined as natural bodies of water (ponds, lakes, rivers, streams), wetlands, habitats of endangered species and non-labelled agricultural crop areas. Applicators must take all precautions necessary to minimize spray drift to these sensitive areas.

APPLICATION INFORMATION

Indaziflam 500SC Herbicide can only be applied by ground equipment. Do not apply by aerial equipment, chemigation, or spot spraying around desired plants.

Apply Indaziflam 500SC Herbicide alone or in an approved tank mixture in a minimum of 10 gallons of spray mixture per acre. Use higher spray volumes to improve distribution in high densities of emerged weeds or debris. Uniform, thorough spray coverage directed to the soil at the base of the crop is important to achieve consistent weed control. Do not allow spray to directly or indirectly contact crop foliage, green bark, roots, or fruit as it may cause localized crop injury. Application may be made as a broadcast treatment or as a banded treatment under vineyard, grove, or orchard crops. When making banded applications use proportionately less spray water and Indaziflam 500SC Herbicide. The dosage listed on this label is for the treated area of the field regardless of the portion of the field that this represents.

Application Equipment

To minimize spray drift to non-target areas, apply this product using nozzles that deliver a medium or larger spray droplet as defined by the ASAE ~~standard~~ S-572.1 and as shown in nozzle manufacturer's catalogues. Keep the spray boom at the lowest possible spray height recommended by the nozzle manufacturer above the target surface. Refer to nozzle manufacturer's recommendations for proper nozzle, pressure setting and sprayer speed for optimum product performance and minimal spray drift. Use sprayers that provide accurate and uniform application to ensure proper distribution. An off-center (OC) nozzle located at the end of the boom may be used to spray near the trunk but must be oriented so that it directs spray to avoid spray contact with crop foliage and green bark. **Maintain adequate agitation at all times including momentary stops. Since settling may occur and be difficult to get back into suspension, spray solution should not be left in the tank overnight.**

Ensure that the spray equipment including spray tank, pumps, lines, filters, screens, and nozzles are clean and free of residue from previous use before mixing and applying Indaziflam 500SC Herbicide by following the instructions listed under SPRAYER CLEANUP PROCEDURE. Residue remaining in the spray equipment from previous uses can cause crop injury if not properly cleaned. After applying Indaziflam 500SC Herbicide follow the cleaning instructions again to ensure that no product remains in the spray equipment.

Appendix 2

Uniform thorough spray coverage is important to achieve consistent weed control. Select nozzles, pressure, and application speed that will deliver medium or larger droplets. Verify that application equipment is in good working condition and is properly calibrated to apply the correct amount of product.

Application Method

Broadcast Applications

For all crops listed on this label, apply Indaziflam 500SC Herbicide by ground equipment at rates described in the **Dose Rate Chart** in the **APPLICATION DIRECTIONS** section for the specific crop or site where this product will be used.

Banded Applications

When making banded applications, use the same dosage rate as for broadcast applications but use proportionately less spray water and Indaziflam 500SC Herbicide. The use rate provided is for the treated area of the field regardless of the portion of the field that it represents. Banded applications may be made using the following formula to calculate the amount of herbicide and spray volume needed for orchard or vineyard strip sprays:

$$\frac{\text{Treated Band width in Inches}}{\text{Row width in Inches}} \times \text{Herbicide Rate per Treated Acre} = \text{Amount of Herbicide Needed for Treatment}$$

$$\frac{\text{Treated Band width in Inches}}{\text{Row width in Inches}} \times \text{Spray Volume per Treated Acre} = \text{Amount of Spray Volume Needed for Treatment}$$

Tank Mix Instructions

Indaziflam 500SC Herbicide may be mixed with and applied in combination with most commonly used pesticides registered for use in the approved crops to expand the spectrum of weed control. Indaziflam 500SC Herbicide will generally provide little or no control of weeds that are already emerged or established at the time of application. When weeds are emerged at application, the addition of a labeled foliar active herbicide such as Rely® 280 Herbicide is needed. Only use products that are approved for use in the crop to which the tank mixture is to be applied.

If Indaziflam 500SC Herbicide is to be tank mixed with liquid fertilizers, other pesticides, or additives, compatibility should be tested prior to mixing. To test for compatibility, use a small container and mix a small amount (0.5 to 1 qt) of spray, combining all ingredients in the same ratio and mixing order as the anticipated use. If any indications of physical incompatibility develop, do not use this mixture for spraying. Indications of incompatibility usually appear 5-15 minutes after mixing.

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

Appendix 2

Mixing Instructions

Ensure that the application equipment has been thoroughly cleaned from previous use before using to apply Indaziflam 500SC Herbicide. Follow the steps listed below:

1. Shake container well to ensure that the product is thoroughly suspended prior to measuring in case some settling has occurred during shipping or storage.
2. Fill the spray tank with 1/2 of the required volume of water prior to the addition of Indaziflam 500SC Herbicide.
3. With the pump and agitator running, add the proper amount of Indaziflam 500SC Herbicide first.
4. Once the Indaziflam 500SC Herbicide is completely dispersed, add any other pesticides, fertilizers or additives if they are to be applied with Indaziflam 500SC Herbicide.
5. Add the rest of the water to the desired volume while maintaining sufficient agitating.

Continue agitation while mixing and during application to ensure a uniform spray mixture.

Re-suspending SC Products in Spray Solution: Like other suspension concentrates (SCs), Indaziflam 500SC Herbicide will settle if left standing without agitation. Reagitate the spray solution for a minimum of 10 minutes before application.

Weed Control

Indaziflam 500SC Herbicide provides residual control of susceptible grass and broadleaf weeds when applied prior to germination. Best weed control is obtained when Indaziflam 500SC Herbicide is applied to a dry soil surface followed by 48 hours without irrigation or rain, and then followed by adequate moisture from rain or an irrigation event within 21 days and prior to weed seed germination and adequate rain or irrigation is received soon after application and prior to weed germination. Supplemental irrigation may be applied following application to improve weed control.

The weed control activity may be reduced if the application is made to dense weed vegetation or to soil covered in heavy crop or weed debris that prevents a uniform distribution of the product reaching the soil. Removing the debris and / or controlling the existing weeds prior to applying Indaziflam 500SC Herbicide may improve weed control. In very dense stands of living weeds, an application of a foliar active herbicide first then followed 3-6 weeks later with the application of Indaziflam 500SC Herbicide is recommended for improved performance.

If weeds are emerged at application, the addition of a foliar active herbicide is needed. The spectrum of weed control may be increased when Indaziflam 500SC Herbicide is tank mixed with other herbicides. Refer to Tank Mix Instructions section.

Rate Ranges

Select proper use rate based on crop or application site and soil texture and percent organic matter content. Soils with high clay content may require a higher use rate of Indaziflam 500SC Herbicide than soils with low clay content. Where rate ranges are given, use lower rates within the range on coarser textured soils and higher rates within the range on finer textured soils. Using the higher rates will provide longer weed control and may also improve control in fields with heavy weed or crop debris.

If individual orchards, vineyards, or citrus groves have multiple %OM contents throughout the area where Indaziflam 500SC Herbicide is to be applied by a single tank or tank mix, then use the lowest rate of Indaziflam 500SC Herbicide corresponding to the lowest %OM content for that area.

Indaziflam 500SC Herbicide may be used on soils with greater than 10% organic matter, however the length and level of weed control may be reduced compared to soils with lower organic matter.

Appendix 2

Weeds Controlled by 1.4 to 2.6 Fl oz/Ac Indaziflam 500SC Herbicide			
Broadleaves		**Grasses**	
Common Name	**Genus/Species**	**Common Name**	**Genus/Species**
Amaranth, spiny	*Amaranthus spinosus*	Barley, mouse	*Hordeum murinum*
Buckwheat, wild*	*Polygonum convolvulus*	Barnyardgrass, common	*Echinochloa crus-galli*
Burclover, California*	*Medicago polymorpha*	Bluegrass, annual	*Poa annua*
Buttercup, corn*	*Ranunculus arvensis*	Brome, downy	*Bromus tectorum*
Carpetweed	*Mollugo verticillata*	Brome, foxtail	*Bromus rubens*
Catsear, spotted***	*Hypochoeris radicata*	Bromegrass, ripgut	*Bromus rigidus*
Celery, wild*	*Apium leptophyllum*	Cheat	*Bromus secalinus*
Chickweed, common	*Stellaria media*	Crabgrass, large	*Digitaria sanguinalis*
Chickweed, mouse-ear	*Cerastium vulgatum*	Crabgrass, smooth	*Digitaria ischaemum*
Clover, crimson***	*Trifolium incarnatum*	Cupgrass, southwestern	*Eriochloa gracilis*
Clover, red*	*Trifolium pratense*	Foxtail, giant	*Setaria faberi*
Clover, white***	*Trifolium repens*	Foxtail, green	*Setaria viridis*
Cudweed, purple	*Gnaphalium purpureum*	Foxtail, yellow	*Pennisetum glaucum*
Dandelion, common (seedling)	*Taraxacum officinale*	Goosegrass	*Eleusine indica*
Eveningprimrose, cutleaf *	*Oenothera laciniata*	Guineagrass	*Panicum maximum*
Fiddleneck, coast	*Amsinckia intermedia*	Junglerice	*Echinochloa colonum*
Filaree, redstem / Storksbill	*Erodium cicutarium*	Lovegrass, tufted	*Eragrostis pectinacea*
Filaree, whitestem	*Erodium moschatum*	Millet, wild proso	*Panicum miliaceum*
Fleabane, hairy	*Erigeron bonariensis*	Oat, wild	*Avena fatua*
Geranium, Carolina	*Geranium carolinianum*	Panicum, fall	*Panicum dichotomiflorum*
Groundsel, common	*Senecio vulgaris*	Panicum, Texas*	*Panicum texanum*
Henbit*	*Lamium amplexicaule*	Ryegrass, Italian (annual)	*Lolium multiflorum*
Horseweed / Marestail	*Erigeron canadensis*	Signalgrass, broadleaf	*Brachiaria platyphylla*
Indigo, Hairy	*Indigofera hirsuta*	Sprangletop, bearded	*Leptochloa fascicularis*
Knotweed, prostrate*	*Polygonum aviculare*	Sprangletop, Mexican	*Leptochloa uninervia*
Kochia	*Kochia scoparia*		
Lambsquarters, common**	*Chenopodium album*		
Lettuce, prickly*	*Lactuca serriola*		
Mallow, common*	*Malva neglecta*		
Mallow, little/ Cheeseweed	*Malva parviflora*		
Morningglory, ivyleaf*	*Ipomoea hederacea*		
Morningglory, pitted*	*Ipomoea lacunosa*		
Mustard, black	*Brassica nigra*		
Mustard, wild	*Sinapis arvensis*		
Nettle, stinging	*Urtica dioica*		
Pigweed, prostrate	*Amaranthus blitoides*		
Pigweed, redroot	*Amaranthus retroflexus*		
Pigweed, smooth	*Amaranthus hybridus*		
Plantain, buckhorn	*Plantago lanceolata*		
Prickly sida / Teaweed	*Sida spinosa*		
Puncturevine, Common*	*Tribulus terrestris*		
Purslane, common	*Portulaca oleracea*		
Purslane, horse	*Trianthema portulacastrum*		
Pusley, Brazilian***	*Richardia brazilensis*		
Pusley, Florida	*Richardia scabra*		
Ragweed, common*	*Ambrosia elatior*		
Redmaids	*Calandrinia caulescens*		
Rocket, London	*Sisymbrium irio*		
Sesbania, hemp / Coffeebean	*Sesbania exaltata*		

Appendix 2

Weeds Controlled by 1.4 to 2.6 Fl oz/Ac Indaziflam 500SC Herbicide			
Broadleaves			
Common Name	**Genus/Species**		
Shepherd's-purse	*Capsella bursa-pastoris*		
Smartweed, Pennsylvania	*Polygonum pensylvanicum*		
Smellmelon	*Cucumis melo*		
Sorrel, red*	*Rumex acetosella*		
Sowthistle, annual	*Sonchus oleraceus*		
Sowthistle, spiny	*Sonchus asper*		
Spanishneedles	*Bidens bipinnata*		
Spurge, garden	*Euphorbia hirta*		
Spurge, prostrate	*Euphorbia supina*		
Spurge, spotted	*Euphorbia maculata*		
Spurry, corn	*Spergula arvensis*		
Sunflower, common*	*Helianthus annuus*		
Swinecress	*Coronopus didymus*		
Thistle, Russian	*Salsola kali*		
Velvetleaf	*Abutilon theophrasti*		
Vetch, purple	*Vicia benghalensis*		
Willowherb, panicle	*Epilobium brachycarpum*		
Woodsorrel, common yellow*	*Oxalis stricta*		
Woodsorrel, Florida yellow	*Oxalis florida*		

* Denotes partial control of these weeds

** Consistent control dependent on timely activation by rain or irrigation

*** Seedling control only

Appendix 2

APPLICATION DIRECTIONS FOR USE ON BLUEBERRY (HIGHBUSH) AND OTHER BUSHBERRY SUBGROUP CROPS IN 13-07B (Aronia berry; blueberry, highbush; buffalo currant; Chilean guava; cranberry, highbush; currant, black; currant, red; elderberry; European barberry; gooseberry; honeysuckle, edible; huckleberry; jostaberry; Juneberry (Saskatoon berry); lingonberry; native currant; salal; sea buckthorn; cultivars, varieties, and/or hybrids of these including rabbiteye blueberries, except blueberry (lowbush).

Only use Indaziflam 500SC Herbicide in established plantings at least one year after the bushes have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 500SC Herbicide to blueberries and bushberries where the soil has completely settled around the bushes and there are no exposed roots, open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Blueberry (HighBush) and Bushberry Plantings and other 13-07B Crops, except Blueberry (lowbush)

Soil Texture	Indaziflam 500SC Herbicide (fl oz product / broadcast acre)			Minimum Plant Age
Sand	Do Not Use			
Any other soil except those that contain 20% or greater gravel content	Soil % Organic Matter Content	Rate Per Application	Max Rate Per Year	1 year*
	%	fl oz/A	fl oz/A	
	< 1	1.4 (0.045 lb ai/A)	2.8 (0.09 lb ai/A)	
	≥ 1	2.0 (0.065 lb ai/A)	4.0 (0.13 lb ai/A)	

Do not apply more than a total of 2.8 fl oz product/A (0.09 lb ai/A) per year on soils containing < 1 % organic matter content, or 4.0 fl oz product/A (0.13 lb ai/A) per year on soils containing ≥1 % organic matter content in a 12 month period when used in any highbush blueberry or bushberry planting.

Only apply Indaziflam 500SC Herbicide to soil as a dormant application in late fall through early spring before bud swell.

Apply Indaziflam 500SC Herbicide as a directed application to the soil beneath the bushes.

When making more than one application per year, allow a minimum of 90 days between applications.

Do not apply more than one application of Indaziflam 500SC Herbicide per cropping season per year in California

Do not use in Blueberry (HighBush) and other Bushberry 13-07B crops grown in sand.

Do not use on soils with 20% or more gravel content.

Do not allow spray to contact green stems, foliage, flowers, or berries or unacceptable injury may occur.

* **Only use** Indaziflam 500SC Herbicide in established plantings at least three years after the bushes have been planted and exhibiting normal growth and good vigor in California.

Appendix 2

APPLICATION DIRECTIONS FOR USE ON CANEBERRY AND OTHER CANEBERRY SUBGROUP CROPS IN 13-07A (Blackberry; loganberry; raspberry, black and red; wild raspberry; cultivars, varieties, and/or hybrids of these)

Only use Indaziflam 500SC Herbicide in established plantings at least one year after the bushes have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 500SC Herbicide to caneberries where the soil has completely settled around the bushes and there are no exposed roots, open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Caneberry Plantings

<table>
<tr><th>Soil Texture</th><th>Indaziflam 500SC Herbicide
(fl oz product / broadcast acre)</th><th>Minimum Plant Age</th></tr>
<tr><td>Sand</td><td>Do Not Use</td><td></td></tr>
<tr><td>Any other soil except those that contain 20% or greater gravel content</td><td>
<table>
<tr><th>Soil % Organic Matter Content</th><th>Rate Per Application</th><th>Max Rate Per Year</th></tr>
<tr><td>%</td><td>fl oz/A</td><td>fl oz/A</td></tr>
<tr><td>< 1</td><td>1.4
(0.045 lb ai/A)</td><td>2.8
(0.09 lb ai/A)</td></tr>
<tr><td>≥ 1</td><td>2.0
(0.065 lb ai/A)</td><td>4.0
(0.13 lb ai/A)</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
</td><td>1 year*</td></tr>
</table>

Do not apply more than a total of 2.8 fl oz product/A (0.09 lb ai/A) per year on soils containing < 1 % organic matter content, or 4.0 fl oz product/A (0.13 lb ai/A) per year on soils containing ≥1 % organic matter content in a 12 month period when used in any caneberry planting.

Only apply Indaziflam 500SC Herbicide to soil as a dormant application in late fall through early spring before bud swell.

Do not apply more than one application of Indaziflam 500SC Herbicide per cropping season per year in California

When making more than one application per year, allow a minimum of 90 days between applications.

Apply Indaziflam 500SC Herbicide as a directed application to the soil beneath the canes.

Do not use in Caneberry 13-07A grown on sand.

Do not use on soils with 20% or more gravel content.

Do not allow spray to contact green stems, foliage, flowers, or berries or unacceptable injury may occur.

* **Only use** Indaziflam 500SC Herbicide in established plantings at least three years after the bushes have been planted and exhibiting normal growth and good vigor in California.

Appendix 2

APPLICATION DIRECTIONS FOR USE IN CITRUS GROVES

Only apply Indaziflam 500SC Herbicide in citrus groves where the soil has completely settled around citrus trees and there are no open channels or depressions in the soil that would allow the product to move into the root zone through open channels.

Citrus Crops: Crop group 10 including Australian desert lime; Australian finger-lime; Australian round lime; Brown River finger lime; calamondin; citron; citrus hybrids; clementine; grapefruit; Japanese summer grapefruit; kumquat; lemon; lime; Mediterranean mandarin; mount white lime; New Guinea wild lime; orange, sour; orange, sweet; pummelo; Russell River lime; satsuma mandarin; sweet lime; tachibana orange; Tahiti lime; tangelo; tangerine (mandarin); tangor; trifoliate orange; uniq fruit; cultivars, varieties, and or hybrids of these

Dose Rate Chart for Citrus Groves

Soil Texture	Indaziflam 500SC Herbicide (fl oz product / broadcast acre)
Any soil except those that contain 20% or greater gravel content	2.0 to 2.6 fl oz/A (0.065 to 0.085 lb ai/A)

Do not apply more than 4.1 fl oz product/A (0.134 lb ai/A) per year or in a 12 month period.
When making more than one application per year, allow a minimum of 90 days between applications.

Use in Established Groves:

Only apply Indaziflam 500SC Herbicide in groves where the trees have been established for a minimum of one year after transplanting.

Use in Recently Planted Citrus Groves:

Indaziflam 500SC Herbicide may be used in groves planted a minimum of one month provided the following condition exists:

1. The transplanted trees were potted plants (such as citripots) and not bare-rooted
2. The trunks are protected from spray contact by nonporous wraps, grow tubes, or waxed containers.
3. The trees are actively growing and exhibiting good health and vigor.

Avoid direct or indirect spray contact with crop foliage, green bark, roots, or fruit as it may cause localized crop injury or death. Only the trunks of trees transplanted more than one year may be sprayed with Indaziflam 500SC Herbicide if the trunk is callused, mature brown bark. Contact of Indaziflam 500SC Herbicide with tissues other than mature brown bark can result in serious damage or plant death.

Appendix 2

APPLICATION DIRECTIONS FOR USE ON COFFEE

Only use Indaziflam 500SC Herbicide in established plantings at least one year after the shrubs have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 500SC Herbicide to coffee shrubs where the soil has completely settled around the shrubs and there are no open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Coffee

Soil Texture	Indaziflam 500SC Herbicide (fl oz product / broadcast acre)			
Any soil except those that contain 20% or greater gravel content	Soil % Organic Matter Content	Maximum Rate of First Application	Maximum Rate of Second Application	Max Rate Per Year
	%	fl oz/A	fl oz/A	fl oz/A
	< 1	1.4 (0.045 lb ai/A)	1.4 (0.045 lb ai/A)	2.8 (0.091 lb ai/A)
	1 to 3	2.0 (0.065 lb ai/A)		3.4 (0.11 lb ai/A)
	> 3	2.7 (0.089 lb ai/A)		4.1 (0.134 lb ai/A)

Do not apply more than the amount of Indaziflam 500SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, % organic matter content, application site, and crop. When making more than one application per year, allow a minimum of 90 days between applications.

Do not use on soils with 20% or more gravel content.
Do not apply more than 4.1 fl oz product/A (0.134 lb ai/A) per year or in a 12 month period when used in Coffee

Do not use in coffee grown on sand.

Do not allow spray to contact green stems, foliage, flowers, or beans or unacceptable injury may occur.

Appendix 2

FRUIT, SMALL, VINE CLIMBING, EXCEPT FUZZY KIWIFRUIT SUBGROUP 13-07F including: Amur river grape; gooseberry; grape; kiwifruit, hardy; maypop; schisandra berry; cultivars, varieties, and/or hybrids of these

Only use Indaziflam 500SC Herbicide in established vineyards at least three years after the vines have been planted and exhibiting normal growth and good vigor. Ensure that the grapes have 6 inches of soil barrier between the soil surface and the major portion of the root system prior to using Indaziflam 500SC Herbicide or injury may occur.

Dose Rate Chart for Grape Vineyards and other 13-07F Crops

Soil Texture	Indaziflam 500SC Herbicide (fl oz product / broadcast acre)			Minimum Vine Age
Sand	Do Not Use			
Any other soil except those that contain 20% or greater gravel content	**Soil Percent Organic Matter Content**	**Rate Per Application**	**Max Rate Per Year**	3 years
	%	**fl oz/A**	**fl oz/A**	
	<1	1.4 to 2.0 (0.045 to 0.065 lb ai/A)	2.0 (0.065 lb ai/A)	
	≥1	1.4 to 2.0 (0.045 to 0.065 lb ai/A)	2.0 (0.065 lb ai/A)	

Do not apply more than the amount of Indaziflam 500SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, percent organic matter content, application site, and crop.

Do not use in grapes grown in Florida or Georgia.

Do not use in grapes grown on sand.

Do not use on soils with 20% or more gravel content.

Do not apply more than a total of 2.0 fl oz product/A (0.065 lbs ai/A) per year or in a 12 month period when used in grape vineyards.

When making more than one application per year, allow a minimum of 90 days between applications.

Appendix 2

APPLICATION DIRECTIONS FOR USE ON HOPS

Only use Indaziflam 500SC Herbicide in established plantings at least one year after the vines have been planted and exhibiting normal growth and good vigor. Only apply Indaziflam 500SC Herbicide to hops vines where the soil has completely settled around the vines and there are no exposed roots, open channels or depressions in the soil that would allow the product to move into the root zone or injury may occur.

Dose Rate Chart for Hops

<table>
<tr><th>Soil Texture</th><th>Indaziflam 500SC Herbicide
(fl oz product / broadcast acre)</th><th>Minimum Plant Age</th></tr>
<tr><td>Sand</td><td>Do Not Use</td><td></td></tr>
<tr><td>Any other soil except those that contain 20% or greater gravel content</td><td>
<table>
<tr><th>Soil % Organic Matter Content</th><th>Rate Per Application</th><th>Max Rate Per Year</th></tr>
<tr><td>%</td><td>fl oz/A</td><td>fl oz/A</td></tr>
<tr><td>< 1</td><td>1.4
(0.045 lb ai/A)</td><td>2.8
(0.09 lb ai/A)</td></tr>
<tr><td>≥ 1</td><td>2.0
(0.065 lb ai/A)</td><td>4.0
(0.13 lb ai/A)</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
</td><td>1 year</td></tr>
</table>

Do not apply more than a total of 2.8 fl oz product/A (0.09 lb ai/A) per year on soils containing < 1 % organic matter content, or 4.0 fl oz product/A (0.13 lb ai/A) per year on soils containing ≥1 % organic matter content in a 12 month period when used in any hops planting.

Do not apply more than two applications of Indaziflam 500SC Herbicide per year.

Application timings can be made as an early spring dormant application and/or as a fall dormant application after vine harvest. The early spring dormant timing can be made on hop shoots that are in the bud stage up to 2" in height.

Apply Indaziflam 500SC Herbicide as a minimum 2-foot band to each side of the hop row.

Do not use in hops grown on sand.

Do not use on soils with 20% or more gravel content.

Do not allow spray to contact green stems, foliage, flowers, or cones or unacceptable injury may occur.

Appendix 2

APPLICATION DIRECTIONS FOR USE IN POME and STONE FRUIT, TREE NUTS, AND CROPS IN THE PROPOSED CROP SUBGROUP 23A; SMALL FRUIT, EDIBLE PEEL SUBGROUP, INCLUDING OLIVE.

For use in pome and stone fruit, pecan, and proposed Crop Subgroup 23A; Small fruit, edible peel subgroup, including olive, only use Indaziflam 500SC Herbicide in orchards where the trees have been established at least three years and exhibiting normal growth and good vigor.

For use in tree nuts, except pecan, only use Indaziflam 500SC Herbicide in orchards where the trees have been established at least one year and exhibiting normal growth and good vigor.

If cracks in the soil or depressions from transplanting are present, fill them in prior to applying Indaziflam 500SC Herbicide.

Pome Fruit: Crop group 11 including: apple; azarole; crabapple; loquat; mayhaw; medlar; pear; pear, Asian; quince; quince, Chinese; quince, Japanese; tejocote; cultivars, varieties, and/or hybrids of these.

Stone Fruit Group 12-12 including: Apricot; apricot, Japanese; capulin; cherry, black; cherry, Nanking; cherry, sweet; cherry, tart; Jujube, Chinese; nectarine; peach; plum; plum, American; plum, beach; plum, Canada; plum, cherry; plum, Chickasaw; plum, Damson; plum, Japanese; plum, Klamath; plum, prune; plumcot; sloe; cultivars, varieties, and/or hybrids of these

Tree Nuts: Crop group 14-12 including: African nut-tree; almond; beechnut; Brazil nut; Brazilian pine; bunya; bur oak; butternut; Cajou nut; candlenut; cashew; chestnut; chinquapin; coconut; coquito nut; dika nut; ginkgo; Guiana chestnut; hazelnut (filbert); heartnut; hickory nut; Japanese horse-chestnut; macadamia nut; mongongo nut; monkey-pot; monkey puzzle nut; Okari nut; Pachira nut; peach palm nut; pecan; pequi; Pili nut; pine nut; pistachio; Sapucaia nut; tropical almond; walnut, black; walnut, English; yellowhorn; cultivars, varieties, and/or hybrids of these

Crops in the proposed Crop Subgroup 23A: Small fruit, edible peel subgroup including: Acerola; African plum; agritos, almondette; appleberry; arbutus berry; bayberry, red; bignay; breadnut; cabeluda; carandas-plum; Ceylon iron wood; Ceylon olive; cherry-of-the-Rio-Grande; Chinese olive, black; Chinese olive, white; chirauli-nut; cocoplum; desert-date; false sandalwood; fragrant manjack; gooseberry, Abyssinian; gooseberry, Ceylon; gooseberry, otaheite; governor's plum; grumichama; guabiroba; guava berry; guava, Brazilian; guava, Costa Rican; guayabillo; illawarra plum; Indian-plum; Jamaica-cherry; jambolan; kaffir-plum; kakadu plum; kapundung; karnada; lemon aspen; mombin, yellow; monos plum; mountain cherry; olive; persimmon, black; pitomba; plum-of-Martinique; rukam; rumberry; sea grape; sete-capotes; silver aspen; water apple; water pear; water berry; wax jambu.

Dose Rate Chart for Pome and Stone Fruit, Tree Nuts, and Crops in the Proposed Crop Subgroup 23A; Small Fruit, Edible Peel Subgroup, Including Olive

Soil Texture	Indaziflam 500SC Herbicide (fl oz product / broadcast acre)			
Any soil except those that contain 20% or greater gravel content	**Soil Percent Organic Matter Content**	**Rate Per Application**	**Max Rate Per Year**	**Minimum Days Between Applications**
	%	**fl oz/A**	**fl oz/A**	**Days**
	<1	1.4 to 2.6 (0.045 to 0.085 lb ai/A)	2.4 to 4.1 (0.078 to 0.134 lb ai/A)	90
	1 to 3	1.4 to 2.6 (0.045 to 0.085 lb ai/A)	3.2 to 4.1 (0.104 to 0.134 lb ai/A)	
	> 3	1.4 to 2.6 (0.045 to 0.085 lb ai/A)	4.1 (0.134 lb ai/A)	

Appendix 2

Do not apply more than the amount of Indaziflam 500SC Herbicide specified per application and per year or in a 12 month period on this label based on soil texture, percent organic matter content, application site, and crop.

When making more than one application per year, allow a minimum of 90 days between applications.

Do not use on soils with 20% or more gravel content.

Do not apply when nuts intended for harvest are on the ground or illegal residues may result.

Do not apply more than a total of 4.1 fl oz of product (0.134 lb ai/A) per year or in a 12 month period when used in pome fruit, stone fruit, tree nuts and Crops in the Proposed Crop Subgroup 23A; Small Fruit, Edible Peel Subgroup, including Olive.

In the California counties of Kern, Inyo, Tulare, Kings, Fresno, and Madera, Indaziflam 500SC Herbicide can only be applied beginning after harvest up to initiation of pink bud stage in almonds, and up to beginning emergence of green leaf tissue in pistachios, walnuts, and pecans.

APPLICATION DIRECTIONS FOR REPLANTED LABELED CROPS IN ESTABLISHED BLUEBERRY (HIGHBUSH) AND OTHER BUSHBERRY SUBGROUP CROPS IN 13-07B, EXCEPT BLUEBERRY (LOWBUSH); CANEBERRY AND OTHER CANEBERRY SUBGROUP CROPS IN 13-07A; COFFEE; FRUIT, SMALL, VINE CLIMBING, EXCEPT FUZZY KIWIFRUIT SUBGROUP 13-07F; HOPS; POME AND STONE FRUIT; SMALL FRUIT, EDIBLE PEEL SUBGROUP, INCLUDING OLIVE ORCHARDS; TREE NUT, AND CROPS IN THE PROPOSED CROP SUBGROUP 23A.

Indaziflam 500SC Herbicide may be used in established orchards/groves/vineyards around new trees or vines (resets/replants) anytime following planting provided the following conditions exist:

1. The soil is completely settled around established and newly planted trees/vines and there are not open channels or depressions in the soil that would allow the product to move into the root zone through open channels.
2. The trunks are protected from spray contact by nonporous wraps, grow tubes, or waxed containers.
3. The trees/vines are exhibiting good health and vigor.
4. Indaziflam 500SC Herbicide can be applied to resets/replants contained within 3 year old and older established grapes, pome and stone fruit, pecan and olive.

Blueberry (highbush) and other bushberry subgroup crops in 13-07B, except blueberry (lowbush): Aronia berry; blueberry, highbush; buffalo currant; Chilean guava; cranberry, highbush; currant, black; currant, red; elderberry; European barberry; gooseberry; honeysuckle, edible; huckleberry; jostaberry; Juneberry (Saskatoon berry); lingonberry; native currant; salal; sea buckthorn; cultivars, varieties, and/or hybrids of these including rabbiteye blueberries, except blueberry (lowbush).

Caneberry and other caneberry subgroup crops in 13-07A: Blackberry; loganberry; raspberry, black and red; wild raspberry; cultivars, varieties, and/or hybrids of these.

Coffee

Fruit, Small, Vine Climbing, Except Fuzzy Kiwifruit Subgroup 13-07F including: Amur river grape; gooseberry; grape; kiwifruit, hardy; maypop; schisandra berry; cultivars, varieties, and/or hybrids of these.

Hops

Pome Fruit Crop group 11 including: apple; azarole; crabapple; loquat; mayhaw; medlar; pear; pear, Asian; quince; quince, Chinese; quince, Japanese; tejocote; cultivars, varieties, and/or hybrids of these.

Stone Fruit Group 12-12 including: Apricot; apricot, Japanese; capulin; cherry, black; cherry, Nanking; cherry, sweet; cherry, tart; Jujube, Chinese; nectarine; peach; plum; plum, American; plum, beach; plum, Canada; plum, cherry; plum, Chickasaw; plum, Damson; plum, Japanese; plum, Klamath; plum, prune; plumcot; sloe; cultivars, varieties, and/or hybrids of these.

Crops in the proposed Crop Subgroup 23A: Small fruit, edible peel subgroup including: Acerola; African plum; agritos, almondette; appleberry; arbutus berry; bayberry, red; bignay; breadnut; cabeluda; carandas-plum; Ceylon iron wood; Ceylon olive; cherry-of-the-Rio-Grande; Chinese olive, black; Chinese olive, white; chirauli-nut; cocoplum; desert-date; false sandalwood; fragrant manjack; gooseberry, Abyssinian; gooseberry, Ceylon; gooseberry, otaheite; governor's plum; grumichama; guabiroba; guava berry; guava, Brazilian; guava, Costa Rican; guayabillo; illawarra plum; Indian-plum; Jamaica-cherry; jambolan; kaffir-plum; kakadu plum; kapundung;

karnada; lemon aspen; mombin, yellow; monos plum; mountain cherry; olive; persimmon, black; pitomba; plum-of-Martinique; rukam; rumberry; sea grape; sete-capotes; silver aspen; water apple; water pear; water berry; wax jambu.

Tree Nuts: Crop group 14-12 including: African nut-tree; almond; beechnut; Brazil nut; Brazilian pine; bunya; bur oak; butternut; Cajou nut; candlenut; cashew; chestnut; chinquapin; coconut; coquito nut; dika nut; ginkgo; Guiana chestnut; hazelnut (filbert); heartnut; hickory nut; Japanese horse-chestnut; macadamia nut; mongongo nut; monkey-pot; monkey puzzle nut; Okari nut; Pachira nut; peach palm nut; pecan; pequi; Pili nut; pine nut; pistachio; Sapucaia nut; tropical almond; walnut, black; walnut, English; yellowhorn; cultivars, varieties, and/or hybrids of these.

Spot spraying is not allowed. Application is made with broadcast equipment delivering a uniform spray pattern.
Avoid direct or indirect spray contact with crop foliage, green bark, roots, or fruit as it may cause localized crop injury or death. Non-protected trunks of reset/replant trees/vines in an established orchard/vineyard planted more than one year may be sprayed with Indaziflam 500SC Herbicide if the trunk is callused, mature brown bark. Contact of Indaziflam 500SC Herbicide with tissues other than mature brown bark can result in serious damage or plant death. If cracks in the soil or depressions are present after planting, fill them in prior to applying Indaziflam 500SC Herbicide.

An established tree nut orchard, except Pecan, is defined as the majority of trees in the orchard established a minimum of one year. Established Pome and Stone Fruit, Pecan, and crops in the Proposed Crop Subgroup 23A; Small Fruit, Edible Peel Subgroup, including Olive orchards and grape vineyards are defined as the majority of trees/vines in the orchard/grove/vineyard established a minimum of three years.

Labeled crops may be planted anytime following an application of Indaziflam 500SC Herbicide if the treated soil is removed from the transplant hole and soil that has not received any application of Indaziflam 500SC Herbicide within the last 12 months is used around the roots of the new transplant.

APPLICATION DIRECTIONS FOR USE IN FARMSTEAD AREAS

Indaziflam 500SC Herbicide will provide preemergence weed control around farmstead building foundations, non-paved farm roads and driveways, farm equipment lots, ungrazed fences, and shelter belts (windbreaks) around cropland when applied according to the directions found on this label.

Refer to the APPLICATION INFORMATION section of this label for application instructions and a list of the weeds that Indaziflam 500SC will control. Apply Indaziflam 500SC Herbicide in a uniform broadcast spray as described in the APPLICATION INFORMATION section of this label. Apply as a directed spray when using under and around desired trees or shrubs such as in a shelterbelt once they are well-established and the soil has finished settling. Apply 2.0 fl oz/A for coarse and medium textured soil or 2.0 to 2.6 fl oz/A for fine textured soil in a minimum spray volume of 10 gallons per acre in a single application. Do not exceed 2.7 fl oz/A (0.088 lb ai/acre) per year or in a 12 month period for any site. For small sprayers mix 0.04 fl oz per gallon water to be applied to 1,000 square feet. Avoid direct or indirect spray contact with foliage, green bark, and roots of desired plants as it may cause localized plant injury or death.

Indaziflam 500SC Herbicide will not control weeds that are already emerged. For postemergence control of weeds, refer to the Tank Mix Instructions section of this label and follow the Mixing Instructions provided. Only use products that are also registered for the specific use where the application of the mixture is intended. When tank mixing products with different restrictions, follow the directions of the most restricted label.

Do not use Indaziflam 500SC Herbicide in farmstead areas on Long Island, NY.

ORNAMENTALS, CHRISTMAS TREES, AND CONIFER PLANTATIONS

Indaziflam 500SC Herbicide may be applied for pre-emergent weed control in landscape ornamentals, hedgerows, production ornamentals in outdoor nurseries, shadehouses, hoophouses, Christmas trees, and conifer plantations. Apply Indaziflam 500SC Herbicide as a directed spray, prior to weed seed germination to the soil surface around dormant or actively growing ornamentals/Christmas trees/conifer plantations as listed in the table below. Apply Indaziflam 500SC Herbicide to established ornamentals/Christmas trees/conifer plantations. If the grower is uncertain about ornamental/Christmas trees/conifer plantations establishment after transplanting, wait 2 months before applying Indaziflam 500SC Herbicide.

Appendix 2

USE RESTRICTIONS FOR INDAZIFLAM 500SC HERBICIDE ON LANDSCAPE AND PRODUCTION ORNAMENTALS, CHRISTMAS TREES, AND CONIFERS

- Do not exceed the maximum single application rates specified under each Ornamental use.
- Do not exceed a total of 2.7 fl oz (0.088 lb ai/acre) of Indaziflam 500SC Herbicide per acre in a 12 month period.
- Do not allow spray to contact foliage. Indaziflam 500SC Herbicide may cause localized injury to the foliage, especially young leaf tissue. If the spray should contact the foliage, remove affected foliage or wash off immediately.
- Do not use Indaziflam 500SC Herbicide around bedding plants (annuals and herbaceous plants not specified, or not listed as tolerant on this label) or in areas where bedding plants may be planted or seeded for a minimum of one year after application of Indaziflam 500SC Herbicide to a landscape bed.
- Do not use Indaziflam 500SC Herbicide around bearing fruit and nut trees.
- Do not use Indaziflam 500SC Herbicide around non-bearing fruit trees unless they are at least 1 year old (citrus) and 3 years old (all others). Non-bearing trees are defined as trees that will not bear fruit until at least 1 year after treatment.
- Do not use Indaziflam 500SC Herbicide within the dripline of bearing fruit and nut trees.
- Do not mix Indaziflam 500SC Herbicide into the soil. Cultivating or disturbing the soil surface after application may reduce weed control activity.
- Avoid applying Indaziflam 500SC Herbicide to heavily mulched landscape beds, as reduced weed control may occur. For best results remove existing mulch and replace mulch after an application of Indaziflam 500SC Herbicide.
- If transplanting mature plants listed as tolerant on this label into soil treated with Indaziflam 500SC Herbicide within the preceding 12 months, discard existing soil from the planting hole and add new soil around roots to minimize effects on plant establishment.
- Do not use Indaziflam 500SC Herbicide on ornamentals being grown in a greenhouse.
- Do not use Indaziflam 500SC Herbicide on nursery seedbeds, rooted cuttings or young plants in liners.
- Do not apply Indaziflam 500SC Herbicide to ornamentals growing in containers except pot-in-pot ornamentals.
- Do not apply Indaziflam 500SC Herbicide to ornamental bulbs in production fields.
- Do not apply Indaziflam 500SC Herbicide to ornamental bulbs in landscapes, commercial fields, or residential sites after they have emerged.
- Do not apply Indaziflam 500SC Herbicide to herbaceous perennials (e.g. hosta) after they have emerged.
- Do not apply Indaziflam 500SC Herbicide over-the-top of ornamentals/Christmas trees/conifer plantations.
- Do not apply Indaziflam 500SC Herbicide to budded grafts or graft unions as this could cause plant injury or death.
- Do not apply Indaziflam 500SC Herbicide by air.

USE OF INDAZIFLAM 500SC HERBICIDE ON ORNAMENTALS/CHRISTMAS TREES/CONIFER PLANTATIONS IN COARSE AND SANDY SOILS

Soil conditions can affect the tolerance of ornamentals/Christmas trees/conifer plantations to Indaziflam 500SC Herbicide. Excessively coarse or sandy soils may allow for downward movement of Indaziflam 500SC Herbicide into the root zone and cause significant root damage and phytotoxicity. Coarse soils, for example, may include significant quantities of sand, gravel, decomposed granite, and ground cinders. Prior to application of Indaziflam 500SC Herbicide on these soils, confirm soil texture with a soil test. Ornamentals/Christmas trees/conifer plantations grown in soil exceeding 80% sand or 20% gravel may be at risk. If Indaziflam 500SC Herbicide is to be applied in these soils, evaluate tolerance of a few plants of each ornamental/Christmas trees/conifer plantations in Indaziflam 500SC Herbicide treated soil for 2 to 3 months prior to a large scale application.

SYMPTOMS OF INDAZIFLAM 500SC HERBICIDE INJURY ON ORNAMENTALS

Indaziflam 500SC Herbicide may injure sensitive ornamentals by damaging roots or leaves. Plant foliage damaged by root absorption will appear stunted, deformed, and may not recover. If Indaziflam 500SC Herbicide is allowed to contact leaves, leaf symptoms including leaf spot, leaf discoloration, and leaf curl may appear. Symptoms appear within several days after application. Leaves formed after appearance of symptoms may recover.

Users must assess the severity of any symptoms on cultivars not listed on this label, before proceeding with large-scale applications of Indaziflam 500SC Herbicide. The user assumes all responsibility for damage on cultivars not listed on this label.

Appendix 2

LANDSCAPE ORNAMENTAL USES

Indaziflam 500SC Herbicide may be used in residential, commercial, as well as federal, state and local plantings of ornamentals and hedgerows for pre-emergent weed control. Indaziflam 500SC Herbicide should be applied as a directed spray only to established (rooted) plants and not to newly rooted cuttings or seedlings. To avoid root damage, apply Indaziflam 500SC Herbicide around transplants when the soil has firmly settled around the root area. Irrigation or rainfall will help to settle the soil and seal surface cracks. Make applications prior to mulching for best weed control. If Indaziflam 500SC Herbicide should contact foliage, wash off immediately to avoid damage. Herbaceous annuals and perennials are sensitive to Indaziflam 500SC Herbicide. Applications of Indaziflam 500SC Herbicide should only be made to ornamentals listed on this label.

AMOUNT TO USE: Apply Indaziflam 500SC Herbicide as a broadcast, directed spray at 0.88 to 1.7 fl oz/acre around ornamentals.

To activate Indaziflam 500SC Herbicide for maximum herbicidal benefit, irrigate the area treated with Indaziflam 500SC Herbicide to move the herbicide into the soil within several days after application. With dry soil, use a minimum of 0.25 inches of irrigation water, and with soil at or greater than field capacity, the amount of irrigation water should be reduced. In either case, do not create conditions that cause visible run-off of irrigation water. Adequate rainfall following an application will negate the need for irrigation.

A subsequent application of Indaziflam 500SC Herbicide can be made within 90 days after the initial application to extend weed control provided that the maximum allowed rate does not exceed 2.7 fl oz (0.088 lb ai/acre) of this product per acre in a 12 month period.

COMBINATIONS OF INDAZIFLAM 500SC HERBICIDE WITH NON-SELECTIVE HERBICIDES AROUND ORNAMENTALS

Remove existing weed growth before application of Indaziflam 500SC Herbicide or use a post-emergence herbicide labeled for control. Indaziflam 500SC Herbicide may be used in combination with a non-selective herbicide. Avoid contact of spray containing a non-selective herbicide with foliage, stems, green bark, or bare roots of turfgrasses, trees, shrubs, or other desirable vegetation, since severe damage may result. If spraying areas adjacent to desirable plants with a non-selective herbicide, use a shield while spraying to help prevent spray from contacting foliage of desirable plants.
It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

PRODUCTION ORNAMENTAL USES

Indaziflam 500SC Herbicide provides up to 8 months of weed control with a single application. The exact length of control depends on many environmental factors as well as the weeds to be controlled and the weed pressure. Apply Indaziflam 500SC Herbicide as a directed spray to the soil surface only to established (rooted) plants in the soil or in pots and not to newly rooted cuttings/or seedling beds in production nurseries. Do not apply Indaziflam 500SC Herbicide to newly rooted cuttings/or seedling beds. To avoid root damage, apply Indaziflam 500SC Herbicide around transplants when the plant is well established and the soil has firmly settled around the root area. Irrigation or rainfall will help to settle the soil and seal surface cracks. Apply Indaziflam 500SC Herbicide around dormant plants. If applied after dormancy, care should be taken not to contact expanding buds or new leaves. Applications of Indaziflam 500SC Herbicide should only be made to ornamentals listed on this label. Indaziflam 500SC Herbicide should be applied to soil free of weeds, debris, and soil clods for optimum efficacy. Herbicidal efficacy may be reduced if soil is disturbed after application.

Application of Indaziflam 500SC Herbicide to deciduous foliage or green bark may result in unacceptable injury. Apply Indaziflam 500SC Herbicide to established ornamentals. If the grower is uncertain about ornamental establishment after transplanting, wait 2 months before applying Indaziflam 500SC Herbicide.

AMOUNT TO USE: Apply Indaziflam 500SC Herbicide as a broadcast, directed spray at 1.1 to 2.7 fl oz (0.088 lb ai/acre) of Indaziflam 500SC Herbicide per acre (0.02 to 0.05 fl oz per 1,000 sq ft) around ornamentals in 20 to 100 gallons of water per acre (0.5 to 2.3 gallons of water per 1,000 sq ft).

To activate Indaziflam 500SC Herbicide for maximum herbicidal benefit, irrigate the area treated with Indaziflam 500SC Herbicide to move the herbicide into the soil within 21 days after application. With dry soil, use a minimum of 0.125 to 0.25 inches of irrigation water. With soil at or greater than field capacity, reduce the amount of irrigation water. In either case, do not create conditions that cause visible run-off of irrigation water. Adequate rainfall following an application will negate the need for irrigation.

A subsequent application of Indaziflam 500SC Herbicide can be made within 90 days after the initial application provided that the maximum allowed rate does not exceed 2.7 fl oz (0.088 lb ai/acre) per acre in a 12-month period.

Do not apply Indaziflam 500SC Herbicide to plant types not listed as tolerant on this label. Indaziflam 500SC Herbicide may be applied to cultivars of listed tolerant plants that are not listed on this label. Prior to large-scale applications, treat a small number of such plants at the desired use rate. Treated plants should then be evaluated 1 to 2 months after application for possible injury and acceptable tolerance.

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IMPORTANT: Direct application of Indaziflam 500SC Herbicide to the soil surface and away from plant foliage and bark. Avoid direct spray contact on plant surfaces, foliage, and green bark or injury may result. Application of Indaziflam 500SC Herbicide after bud swell may cause injury if herbicide contacts foliage. Avoid application under environmental conditions that favor drift to non-targeted areas. Deep cultivation reduces the effectiveness of Indaziflam 500SC Herbicide and should be avoided.

COMBINATIONS OF INDAZIFLAM 500SC HERBICIDE WITH NON SELECTIVE HERBICIDES AROUND ORNAMENTALS

Remove existing weed growth before application of Indaziflam 500SC Herbicide or use a post-emergence herbicide labeled for control. Indaziflam 500SC Herbicide may be used in combination with a non-selective herbicide. Avoid contact of spray containing a non-selective herbicide with foliage, stems, green bark, or bare roots of turfgrasses, trees, shrubs, or other desirable vegetation, since severe damage may result. If spraying areas adjacent to desirable plants with a non-selective herbicide, use a shield while spraying to help prevent spray from contacting foliage of desirable plants.

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

ORNAMENTALS AND THEIR CULTIVARS TOLERANT TO INDAZIFLAM 500SC HERBICIDE

Tolerant ornamentals and their cultivars are listed in the following table. Apply as a directed spray around tolerant ornamentals. If a cultivar to be treated is not listed on this label, treat several plants of the cultivar at the single maximum desired use rate and evaluate 1 to 2 months later for possible injury and acceptable tolerance. The user assumes responsibility for application on plants not listed in this table.

Common Name	Scientific Name	Cultivar
Abelia	*Abelia grandiflora*	
Apple	*Malus sp.*	(non-bearing)
Apple	*Malus domestica*	Haralred (non-bearing)
Arborvitae	*Thuja occidentalis*	Nigra
Arborvitae	*Thuja occidentalis*	Techny
Arborvitae	*Thuja occidentalis*	Green Giant
Asparagus Fern	*Asparagus plumosus*	
Aspen, Quaking	*Populus tremuloides*	
Azalea	*Rhododendron sp.*	Girard's Rose
Azalea	*Rhododendron sp.*	Fashion
Azalea	*Rhododendron sp.*	VF 14
Azalea	*Rhododendron sp.*	Golden Torch
Azalea, Encore	*Rhododendron sp.*	Autumn Debutante
Bald Cypress	*Taxodium distichum*	
Bamboo, Golden	*Phyllostachys aurea*	
Barberry	*Berberis sp.*	
Birch	*Betula populifolia*	Whitespire
Birch, River	*Betula nigra*	Heritage
Birch, River	*Betula nigra*	
Black Tupelo	*Nyssa sylvatica*	Wild Fire
Bluebird	*Caryopteris x clandonensis*	Dark Knight
Boxwood	*Buxus microphylla*	Green Beauty
Boxwood	*Buxus microphylla*	Chicagoland Green
Boxwood	*Buxus microphylla*	Baby Gem
Boxwood	*Buxus microphylla*	Wintergreen
Butterfly Bush	*Buddleia*	Nanho Blue
Camellia	*Camellia japonica*	Margaret Heathcliff Pink
Camellia	*Camellia sasanqua*	Cleopatra Pink
Catalpa, Southern	*Catalpa bignoniaceae*	
Cedar, Atlantic white	*Chamaecyparis sp.*	
Cedar, Eastern Red	*Juniperus virginiana*	
Cedar, Japanese	*Cryptomeria japonica*	Black Dragon
Cedar, Japanese	*Cryptomeria japonica*	Burkii
Cedar, Japanese	*Cryptomeria japonica*	Yoshino
Cherry, American Plum	*Prunus americana*	
Cherry, Okame	*Prunus x incamp*	
Cherry,	*Prunus serrulata*	Kwanzan

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Cherry, Purple Leaf Sand	*Prunus cistena*	
Cherry, Sargent	*Prunus sargentii*	Spring Wonder
Cherry, Yoshino	*Prunus x yedoensis*	Yoshino
Chokeberry	*Aronia sp.*	
Cotoneaster	*Cotoneaster dammeri*	Coral Beauty
Cottonwood	*Populus deltoides*	Sioux
Crabapple	*Malus x 'Harvest Gold'*	
Crabapple	*Malus x 'Snowdrift'*	
Crabapple	*Malus coronaria*	
Crape Myrtle	*Lagerstroemia indica x fauriei*	Muskogee
Crape Myrtle	*Lagerstroemia x 'Miami'*	
Crape Myrtle	*Lagerstroemia indica x fauriei*	Tuscarora
Cotoneaster	*Cotoneaster*	Coral Beauty
Cypress, false	*Chamaecyparis sp.*	Gold Mops
Cypress, Mediterranean	*Cupressus sempervirens*	
Cypress, Leyland	*Cupressus x leylandii*	
Daphne	*Daphne caucasica*	Summer Ice
Dawn Redwood,	*Metasequoia glyptostroboides*	
Day-lily (before unfurling)	*Hemerocallis sp.*	Green Flutter
Day-lily (before unfurling)	*Hemerocallis sp.*	Stella d'Oro
Dogwood, Kousa	*Cornus kousa*	Kousa
Elm, American	*Ulmus americana*	
Elm, Bosque	*Ulmus parvifolia*	
Eucalyptus, Silver Dollar Gum	*Eucalyptus polyanthemos*	
Euonymus,	*Euonymus alatus*	Compacta
Fir,	*Abies fraseri*	
Florida Pipestem	*Leucothoe populifolia*	
Forsythia	*Forsythia*	Lynwood
Forsythia	*Forsythia sp.*	Golden Bells
Fragrant tea olive	*Osmanthus fragrans*	
Gardenia	*Gardenia radicans*	Radicans
Gardenia	*Gardenia jasminoides*	Mystery
Gardenia	*Gardenia jasminoides*	Frostproof
Gaura	*Gaura lindheimeri*	Pink Fountain
Gold-Dust Plant	*Aucuba japonica*	Gold Dust
Green Ash	*Fraxinus pennsylvanica*	
Green Ash	*Fraxinus pennsylvanica*	Georgia Gem
Hardy Kiwi	*Actinidia arguta*	Anna
Hawthorn, Thornless	*Crataegus crus-galli*	Inermis
Hibiscus, Chinese	*Hibiscus rosa-sinensis*	San Diego Red
Holly,	*Ilex x aquip*	
Holly,	*Ilex x attenuata*	East Palatka
Holly, Chinese	*Ilex cornuta*	Needlepoint
Holly, Foster	*Ilex x attenuata*	Fosteri
Holly, Gallberry	*Ilex glabra*	Densa
Holly, Meservae	*Ilex meservae*	Blue Princess
Holly, Nellie R. Stevens	*Ilex*	Nellie R. Stevens
Holly, American	*Ilex opaca*	
Holly,	*Ilex verticillata*	Jim Dandy
Holly,	*Ilex verticillata*	Red Sprite
Holly, Japanese	*Ilex crenata*	Sky Pencil
Honeylocust,	*Gleditsia tricanthos*	Sunburst
Honeylocust,	*Gleditsia tricanthos*	Skyline
Indian Hawthorn	*Raphiolepsis indica*	Pink Lady
Japanese Cleyera	*Ternstromia gymnanthera*	
Japanese Mock-orange	*Pittosporum tobira*	Variegata
Jasmine, Asiatic/Yellow Star	*Trachelospermum asiaticum*	
Jasmine, winter	*Jasminum nudiflorum*	
Juniper, Bar Harbour	*Juniperus horizontalis*	Bar Harbour
Juniper, Blue Pacific	*Juniperus conferta*	Blue Pacific
Juniper, Blue Rug	*Juniperus horizontalis*	Blue Rug

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Juniper, Brodie	*Juniperus virginiana*	
Juniper, Spartan	*Juniperus chinensis*	Spartan
Lantana	*Lantana camara*	Landmark Sunrise Rose
Lilac	*Syringa x 'Penda'*	Bloomerang
London Plane Tree,	*Plantanus acerifolia*	
Loropetalum	*Loropetalum chinensis*	Burgundy
Loropetalum	*Loropetalum chinensis*	Ruby
Magnolia,	*Magnolia grandiflora*	Bracken Brown Beauty'
Magnolia,	*Magnolia grandiflora*	Little Gem
Magnolia, Jane	*Magnolia liliflora 'Nigra' x M. stellata*	Rosea
Maple, Autumn Blaze	*Acer freemanii*	Jeffersred
Maple, red	*Acer rubrum*	
Maple, Red	*Acer rubrum*	Red Sunset
Maple, Red	*Acer rubrum*	October Glory
Maple, Silver	*Acer saccharinum*	
Maple, Sugar	*Acer saccharum*	
Maple, Sugar	*Acer saccharum*	Commemoration
Nandina	*Nandina domestica.*	Firepower
Ninebark,	*Physocarpus opulifolius*	Summer Wine
Oak, Southern Live	*Quercus virginiana*	
Oak, Cathedral Live	*Quercus virginiana*	SDLN
Oak, Northern Red	*Quercus rubra*	
Oak, Nuttal	*Quercus nuttallii*	
Oak, Shumard	*Quercus shumardii*	
Ohio Buckeye,	*Aesculus glabra*	
Palm, Areca	*Dypsis lutescens*	
Palm, Manila	*Adonidia merrillii*	
Palm, Alexander	*Archontophoenix alexandre*	
Palm, Florida Thatch	*Thrinax radiate*	
Palm, Spindle	*Hyophorbe verschaffeltii*	
Pear, Callery	*Pyrus calleryana*	Chanticleer
Pear, Callery	*Pyrus calleryana*	Bradford
Pieris,	*Pieris japonica*	Shojo
Pine, Canary Island	*Pinus canariensis*	
Pine, Eastern White	*Pinus strobus*	
Pine, Scotch	*Pinus sylvestrus*	
Pistache, Texas	*Pistacia texana*	
Plum, Crimson Pointe	*Prunus x cerasifera*	Cipriozam
Podocarpus	*Podocarpus macrophyllus*	
Privet,	*Ligustrum sp.*	
Redbud, Eastern	*Cercis canadensis*	MN Strain
Redbud,	*Cercis reniformis*	Oklahoma
Rhododendron,	*Rhododendron x crete*	
Rose,	*Rosa wichurana*	Dr. Huey
Rose	*Rosa sp.*	Pink Knock Out®
Rose	*Rosa sp.*	Knock Out®
Rose, Virginia	*Rosa virginiana*	
Rose Mallow	*Hibiscus moscheutos*	
Rose of Sharon	*Hibiscus syriacus*	Pink Heart
Rose of Sharon	*Hibiscus syriacus*	Boule de Feu
Russian Sage	*Perovskia atriplicifolia*	
Skip Laurel,	*Prunus laurocerasis*	
Snowberry, common	*Smyphoricarpos albus*	
Spicebush,	*Lindera benzoin*	
Spruce, Blackhills	*Picea glauca*	
Spruce, Norway	*Picea abies*	
Tamarisk,	*Tamarix ramosissima*	Pink Cascade
Taxus (Yew)	*Taxus cuspidata*	Capitada
Thin-fruit Sedge	*Carex flaccosperma*	
Viburnum, Burkwood	*Viburnum x burkwoodii*	
Virbunum	*Virbunum lantana*	Mohican
Viburnum, popcorn	*Viburnum plicatum*	Popcorn

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Wax myrtle, southern	*Myrica cerifera*	
Weigelia, variegated	*Weigelia variegate*	

Do not use Indaziflam 500SC Herbicide on any of these plants, as injury will occur.

Common Name	Scientific Name
Blue Fescue Grass	*Festuca glauca*
Columbine	*Aquilegia canadensis*
Coneflower	*Echinacea purpurea*
Croton	*Codiaeum variegatum*
Dianthus	*Dianthus sp.*
Euonymus, Japanese	*Euonymus japonicus*
Fountain Grass	*Pennisetum alopecuroides*
Fountain Grass, purple	*Pennisetum setaceum*
Golden Dewdrops	*Duranta erecta*
Hydrangea	*Hydrangea macrophylla*
Ixora	*Ixora coccinea*
Lavender, Munstead	*Lavandula angustifolia*
Lilyturf	*Liriope sp.*
Mint	*Mentha sp.*
Mondo Grass	*Ophiopogon japonicus*
Muhlygrass	*Muhlenbergia capillaries*
Plumbago	*Plumbago spp.*
Sage	*Salvia spp*
Sweet Viburnum	*Viburnum odoratissimum*
Tickseed, Dwarf mouse-ear	*Coreopsis auriculata*
Weigela	*Weigela spp.*

CONIFERS AND CHRISTMAS TREES

Indaziflam 500SC Herbicide may be used for pre-emergence weed control in conifer nurseries and Christmas tree farms. Indaziflam 500SC Herbicide may be applied as a directed spray to soil surrounding established plants. Avoid contacting plant stems and leaves with the directed spray solution as injury may occur. Established plants are transplants that are actively growing and where the soil has settled. Do not apply to seedlings or seedling beds. Apply 1.1 to 2.3 fl oz of Indaziflam 500SC Herbicide per acre for these uses. Do not exceed 2.7 fl oz (0.088 lb ai/acre) of Indaziflam 500SC Herbicide per acre in a growing season.

Indaziflam 500SC Herbicide may be tank-mixed with products containing the following active ingredients labeled for use in conifers: glyphosate or glufosinate. Do not apply tank-mixes of Indaziflam 500SC Herbicide with these active ingredients to conifer and Christmas tree foliage. Follow use restrictions on all labels.

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

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SPRAYER CLEANUP PROCEDURE

Before and after using Indaziflam 500SC Herbicide, thoroughly clean all mixing and spray equipment, including tanks, pumps, lines, filters, screens, and nozzles with a good quality tank cleaner on an approved rinse pad or on the field site where an approved crop is being grown. Clean sprayer thoroughly after each use and before Indaziflam 500SC Herbicide residue dries in the equipment. Proper PPE must be worn while cleaning.

1. Completely drain all remaining spray solution from the tank in an appropriate location.
2. Clean the sprayer using a commercially available tank cleaner following the use instructions provided by the manufacturer. A rotating cleaning nozzle may be beneficial to dislodge any product from the sides of the tank.
3. Drain all cleaning solution from the tank and lines in an appropriate location.
4. Rinse the tank and flush spray booms with clean water to remove the cleaning solution.
5. Remove, clean, and inspect filters, screens, nozzles, and boom endcaps if equipped to ensure that no product remains.
6. Rinse the inside and outside of the spray tank and all lines once more with clean water.
7. Drain all rinse solution in an appropriate location.

If any Indaziflam 500SC Herbicide is left in the spray equipment and subsequently applied to another crop it has the potential to cause injury to that crop.

ROTATIONAL CROP RESTRICTIONS

Indaziflam 500SC Herbicide is intended for use in perennial tree and vine crops listed in this label and for non-crop farmstead uses. Do not rotate to any crops not listed on this label within 24 months after the last application. Planting earlier than this may result in crop injury or death. If a crop is not on this label, a bioassay should be conducted prior to planting if Indaziflam 500SC Herbicide has been used in the previous 36 months. A successful field bioassay means growing a test strip or several plots of the intended crop from seed or transplant to maturity without any observed herbicide symptoms. The test should be conducted in representative areas across the field that includes knolls, low areas, field edges, and changes in soil texture. The rotational crop interval must be extended if the field bioassay does not result in acceptable crop tolerance.

Labeled citrus crops may be transplanted into soil previously treated with Indaziflam 500SC Herbicide 1 month or more after the last application provided potted trees (such as citripots) are used.

New orchards of labeled pome and stone fruit, tree nut and olive may be established in a location previously treated with Indaziflam 500SC Herbicide 1 year after application. Grape vineyards may be established in a location previously treated with Indaziflam 500SC Herbicide 2 years after application. In labeled pome and stone fruit, tree nuts, grapes, and olive previously treated soil must be thoroughly mixed to a depth of at least 6 inches prior to planting. This may be done through any combination of tillage operations such as ripping, disking, or plowing.

If other herbicides have also been used, follow the most restrictive label for the crop rotation interval.

RESISTANCE MANAGEMENT

Indaziflam, the active ingredient in this product, is a Group 29 herbicide based on the mode of action classification system of the Weed Science Society of America. A given weed population may contain plants naturally resistant to Group 29 herbicides. Such resistant weed plants may not be effectively managed using Group 29 herbicides but may be effectively managed using another herbicide alone or in mixtures from a different Group and/or by using cultural or mechanical practices. However, a herbicide mode of action classification by itself may not adequately address specific weeds that are resistant to specific herbicides. Consult your local company representative, state cooperative extension service, professional consultants or other qualified authorities to determine appropriate actions for treating specific resistant weeds.

Best Management Practices

Proactively implementing diversified weed control strategies to minimize selection for weed populations resistant to herbicides is recommended. A diversified weed management program may include the use of multiple herbicides with different modes of action with overlapping weed control spectrum, tillage operations and/or other cultural practices that control weeds. Research has demonstrated that using the labeled rate and directions for use is important to delay the selection for resistance. Scouting after a herbicide application is important because it can facilitate the early identification of weed shifts and/or weed resistance and thus provide direction on future weed management practices. One of the best ways to contain resistant populations is to implement measures to avoid allowing weeds to reproduce by seed or to proliferate vegetatively. Cleaning equipment between sites and avoiding movement of plant material between sites will greatly aid in retarding the spread of resistant weed seed.

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There are no known cases of weed resistance to Indaziflam 500SC Herbicide or any known instances of cross resistance between Indaziflam 500SC Herbicide and other classes of herbicides or modes of action. Research has shown that performance of Indaziflam 500SC Herbicide is not affected by the presence of biotypes resistant to glyphosate, triazines, ALS-inhibiting, growth regulant, or other herbicide modes of action.

To delay the development of herbicide resistance, the following practices are recommended:

- Use herbicides with different modes of action in the tank mixture, rotation, or in conjunction with alternate cultural practices.
- Always use at least the minimum rate specified by the label and observe all use rate instructions.
- Avoid the consecutive use of Indaziflam 200SC Herbicide unless another herbicide that is effective on the same target weeds is used in rotation or as a tankmix partner.
- Base herbicide use on a comprehensive Integrated Pest Management (IPM) program.
- Monitor treated areas and control escaped weeds by alternate means.
- Contact local extension or crop advisor for IPM and resistance management information.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Protect the product from freezing temperatures. Store the product at temperatures above 32°F and preferably above 40°F.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER HANDLING

Rigid, Non-refillable containers small enough to shake (i.e., with capacities equal to or less than 5 gallons)

Non-refillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Offer for recycling, if available or reconditioning, if appropriate. Then puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities.

Rigid, Non-refillable containers (greater than 5 gallons or 50 lbs)

Non-refillable Containers

Non-refillable containers - Do not reuse or refill this container. Refer to Bottom Discharge IBC or Top Discharge IBC, Drums, Kegs information as follows.

Bottom Discharge IBC (e.g. – Schuetz Caged IBC or Snyder Square Stackable)

Pressure rinsing the container before final disposal is the responsibility of the person disposing of the container. To pressure rinse the container before final disposal, empty the remaining contents from the IBC into application equipment or mix tank. Raise the bottom of the IBC by 1.5 inches on the side which is opposite of the bottom discharge valve to promote more complete product removal. Completely remove the top lid of the IBC. Use water pressurized to at least 40 PSI to rinse all interior portions. Continuously pump or drain rinsate into application equipment or rinsate collection system while pressure rinsing. Continue pressure rinsing for 2 minutes or until rinsate becomes clear. Replace the lid and close bottom valve.

Top Discharge IBC, Drums, Kegs (e.g.– Snyder 120 Next Gen, Bonar B120, Drums, Kegs).

Triple rinsing the container before final disposal is the responsibility of the person disposing of the container. To triple rinse the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container at least 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Rinse all interior surfaces. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this procedure two more times.

Once container is rinsed, offer for recycling if available or puncture and dispose of in a sanitary landfill.

Refillable Containers

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Refillable container – Refer to Bottom Discharge IBC or Top Discharge IBC, Drums, Kegs information as follows. Refill this container with pesticide only. Do not reuse this container for any other purpose. Contact your Ag retailer or Bayer CropScience for container return, disposal and recycling information.

Bottom Discharge IBC (e.g. – Schuetz Caged IBC or Snyder Square Stackable)

Pressure rinsing the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To pressure rinse the container before final disposal, empty the remaining contents from the IBC into application equipment or mix tank. Raise the bottom of the IBC by 1.5 inches on the side which is opposite of the bottom discharge valve to promote more complete product removal. Completely remove the top lid of the IBC. Use water pressurized to at least 40 PSI to rinse all interior portions. Continuously pump or drain rinsate into application equipment or rinsate collection system while pressure rinsing. Continue pressure rinsing for 2 minutes or until rinsate becomes clear. Replace the lid and close bottom valve.

Top Discharge IBC, Drums, Kegs (e.g.– Snyder 120 Next Gen, Bonar B120, Drums, Kegs).

Triple rinsing the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To triple rinse the containers before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container at least 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Rinse all interior surfaces. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this procedure two more times.

Once container is rinsed, offer for recycling if available or puncture and dispose of in a sanitary landfill.

End users are authorized to remove tamper evident cables as required to remove the product from the container unless the container is equipped with one way valves and refilling or returning is planned. If this is the case, end users are not authorized to remove tamper evident cables, one way valves or clean container.

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IMPORTANT: READ BEFORE USE

Read the entire Directions for Use, Conditions, Disclaimer of Warranties and Limitations of Liability before using this product. If terms are not acceptable, return the unopened product container at once.

By using this product, user or buyer accepts the following Conditions, Disclaimer of Warranties and Limitations of Liability.

CONDITIONS: The directions for use of this product are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application, all of which are beyond the control of Bayer CropScience LP. All such risks shall be assumed by the user or buyer.

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PRODUCED FOR

Bayer CropScience

Bayer CropScience LP
P.O. Box 12014, 2 T.W. Alexander Drive
Research Triangle Park, North Carolina 27709
1-866-99BAYER (1-866-992-2937)

Indaziflam 500SC Herbicide (MASTER) 7/05/2017

AMERICAN PISTACHIO GROWERS

December 13, 2016

Ann Prichard
California Department of Pesticide Regulation
Pesticide Registration Branch
1001 I Street
Sacramento, CA 95812-4015

RE: Request for EPA-CDPR Concurrent Review for Alion Complete

Dear Ms. Prichard,

American Pistachio Growers, a trade association representing over 625 pistachio growers in California, Arizona and New Mexico, would like to request concurrent review (EPA and CDPR) on Alion Complete a product made by Bayer CropScience (Bayer). Alion Complete is registered under Bayer CropScience for agricultural uses.

Alion Complete will be a co-formulated WG mixture of Alion Herbicide, registered as CDPR Reg. No. 264-1106-AA, containing 19.05% indaziflam together with DuPont's Matrix SG Herbicide, registered as CDPR Reg. No. 352-768-AA, containing 25% rimsulfuron.

Applicators currently tank mix Alion Herbicide with DuPont Matrix SG Herbicide for a broader spectrum residual weed control. There are several benefits for an in-can mixture of these products, including occupational safety, weed resistance management, decreasing the need for follow-up burn-down herbicides, and overall performance.

Bayer anticipates its submission to the EPA in May, 2017. Per California Notice 2015-03, Bayer is submitting justification with documentation to support their request for a concurrent review with CDPR. The attributes of this new product is beneficial to users in the pistachio and entire nut industry where labeled uses allow.

Proposed Benefits:

Benefits for Occupational safety—loading multiple premixed actives reduces the potential for an accidental exposure to workers based on the decreased number of mixing and loading events when compared to individually mixing and loading each component separately.

Benefit of Dry Formulation—Dry products are preferred by many applicators due to reduced weight and volume associated with liquid herbicides. This combination product would also reduce the need to measure two different herbicides which also improves efficiency and reduces the potential errors associated with measuring. The WG formulation is more concentrated which reduces the amount of packaging material and disposal costs.

9 RIVER PARK PLACE EAST, SUITE 410 | FRESNO, CA 93720-1530 | TEL: 559.475.0435 FAX: 559.475.0624 | AmericanPistachios.org

Appendix 3

Improved Weed Control—the application rate of Alion Herbicide can be lowered by the addition of a low rate of Dupont Matrix SG Herbicide and still achieve equivalent grass and broadleaf control. Application of the in-can formulation at 3 oz/acre is the equivalent of the two products at their lowest rates, Alion Herbicide at 3.5 oz/acre and Dupont Matrix SG Herbicide at 2 oz/acre. This is good news for growers that less product can be used and achieve the same, or better level of control.

Solution for Sensitive Areas—both indaziflam and rimsulfuron are very safe to use around tree crops compared to other bareground herbicides. Providing a single use product for sensitive sites with defined active ingredient ratios will reduce the potential for off-target crop and tree damage.

Weed Resistance Management—The co-formulated products complement each other in having excellent pre-emergent weed control with indaziflam and excellent pre-post activity with rimsulfuron. Weed seeds that have already germinated are not well-controlled by indaziflam but are controlled by rimsulfuron. The overall weed control is more thorough and commonly does not require follow-up applications of burn-down herbicides from "escaped" weeds. The simultaneous use of both products will insure these remain useful tools to farmers and other applicators as long as possible.

Thank you for consideration of my comments. Please let me know if you have any questions.

Thank you,

Richard Matoian

Richard Matoian
Executive Director

Appendix 3

CALIFORNIA FRESH FRUIT ASSOCIATION

978 West Alluvial, Suite 107, Fresno, California 93711-5700
PHONE 559.226.6330 FAX 559.222.8326
www.CAFreshFruit.com

December 10, 2016

Ann Prichard
Registration Branch Chief
California Department of Pesticide Regulation
1001 I Street
Sacramento, CA 95812-4015

Email: Ann.Prichard@cdpr.ca.gov

Ref: Bayer CropScience – Alion Complete Request for Concurrent Review for Registration

Dear Ms. Prichard,

The California Fresh Fruit Association (CFFA) is a voluntary agricultural trade association which represents permanent fresh fruit crops produced within California. CFFA is the primary public policy organization for the fresh fruit industry; table grapes, berries and deciduous tree fruit and represents the industry's interests on legislative and regulatory issues at state, federal and international levels. The membership of CFFA is comprised of growers, packers/shippers, marketers and associations indirectly involved with the production of fresh fruit commodities.

Our members are extremely interested in the development and safe use of pest management tools including crop protection chemicals for vegetative management uses within the production of fresh fruits. Most orchardists and pest control advisors are well aware of herbicide resistant weeds and the challenge it presents for weed management.

Weed management in orchard and vine crops is complex and getting further complicated by herbicide resistant weeds. As a result of our relatively mild climate and seasonally variable temperature and moisture conditions, we encounter weed germination and emergence in every season. Strategies to manage a fraction of the weeds present may not work equally well for other species and so handling weed problems requires that we continue to support registrations that will increase the number of effective weed management tools available to growers.

Appendix 3

CFFA would like to communicate support for the request of a concurrent review with the U.S. Environmental Protection Agency (EPA) for the new co-formulated product of Alion Complete (Bayer CropScience) and the EPA registration anticipated submission date of May 2017.

Sincerely,
California Fresh Fruit Association

M. L. Martin

Marcy L. Martin
Director, Trade

c: George P. Radanovich, President

Appendix 3

December 13, 2016

Ann Prichard
Registration Branch Chief
California Department of Pesticide Regulation
1001 I Street
Sacramento, CA 95812-4015
Ann.Prichard@cdpr.ca.gov

RE: Support for concurrent State/Federal review of Alion Complete (indaziflam plus rimsulfuron) herbicide

This letter is written to express support of the University of California weed science program for California Department of Pesticide Regulation to review the submitted label for the herbicide "Alion Complete" (active ingredients indaziflam and rimsulfuron) concurrently with the Federal label registration. John Roncoroni is a weed science Cooperative Extension Farm Advisor working primarily in the perennial crops of Napa, Sonoma, and Yolo counties. Brad Hanson is a Weed Science Cooperative Extension Specialist with a statewide research and extension program in orchard and vineyard weed control and herbicide performance and crop safety.

The herbicide Alion Complete would be of benefit to the California perennial crop market with very little downside or risks. Both active ingredients, indaziflam (as Alion) and rimsulfuron (as Matrix and other formulations) are widely used already in this market. In fact, because of their complementary weed control property and modes of action, they are very often used together as a tank mix. From our perspective, there are several important benefits to this co-formulation of these two widely used and demonstrably safe herbicides.

First, **herbicide-resistant weed management.** One of the primary current challenges in orchard and vineyard crops is the evolution of glyphosate-resistant weeds. Two recommendations for managing current resistance problems and minimizing selection for new resistant populations include rotating herbicide modes of action over time and utilizing more than one mode of action in mixture. The two active ingredients in Alion Complete have been important tools for managing glyphosate resistance because they are both preemergence herbicides (compared to glyphosate which has only postemergence activity). These herbicides each affect a different target site than glyphosate: indaziflam is a cellulose biosynthesis inhibitor and rimsulfuron inhibits the enzyme acetolactate synthase (ALS) while glyphosate affects an enzyme called EPSPS. When applied together, either as a tankmix or in this premix formulation, they provide overlapping activity on many important weeds which more effectively manages glyphosate resistant weeds and minimizes the chance of resistance to either and of them.

Second, **weed control performance.** One of the strengths of Alion herbicide (indaziflam) is the excellent duration of weed control which, in some cases, can last for 6 or more months and reduce the need for late season applications of post-emergence herbicides (eg glyphosate, glufosinate, or paraquat among others). However, indaziflam has little postemergence activity and must be incorporated by irrigation or rainfall to initiate activity. Rimsulfuron, on the other hand, typically does not provide as long of duration of control but does have some postemergence activity and greater potential to control seedlings that germinate before proper rainfall incorporation occurs. This complementary nature is the primary reason why indaziflam and rimsulfuron are commonly used in tank mixes in California

course the premix formulation is not likely to be substantially better than the tankmix in this regard, but would simplify the process and reduce handling of the pesticides and packaging waste.

As alluded to above, since the two active ingredients are commonly applied together, co-packaging them would provide benefits in terms of **reduced packaging waste and reducing loader/mixer exposure** simply by having one package instead of two. As Alion Complete would be formulated as a WG, this premix would have additional **worker safety, spill and packaging cleanup, and measuring accuracy** compared to the liquid formulations of Alion (either as the currently sold 200SC or the newer 500SC).

In conclusion, because these two active ingredients are commonly used in California in their solo-product formulations, their use and safety is well documented and there should be no increased environmental risk for the co-formulation. The two herbicides are commonly used as a tankmix; thus a co-formulation should provide some benefit in terms of decreased packaging waste and potential worker exposure.

Although the co-formulation is not likely to dramatically change weed management in perennial crops, we believe it does provide important benefits and poses virtually no risks compared to tankmixes of the two widely used solo products.

We support concurrent CDPR and Federal review of the Alion Complete label to expedite its use in California orchard and vineyard cropping systems.

Best regards,

Brad Hanson
Cooperative Extension Weed Science Specialist
Department of Plant Sciences
UC Davis
bhanson@ucdavis.edu
530-752-8115

John Roncoroni
Weed Science Farm Advisor
UC Cooperative Extension
Napa CA
jaroncoroni@ucanr.edu
707-253-7259

Appendix 3

WESTERN AGRICULTURAL PROCESSORS
ASSOCIATION

1785 N. Fine Avenue, Fresno, California 93727
559-455-9272
f: 559-251-4471
www.agprocessors.org

December 12, 2016

Ms. Ann Prichard
California Department of Pesticide Regulation
Pesticide Registration Branch
1001 I Street
Sacramento, CA 95812-4015

Reference: ***Request for EPA-CDPR Concurrent Review for Alion Complete***

Dear Ms. Prichard,

The Western Agricultural Processors Association (WAPA) represents hullers/shellers and processors of almonds, walnuts, pistachios and pecans in California on regulatory and legislative issues that impact the tree nut industry such as pesticides, safety, water, labor and air quality issues. WAPA is requesting a concurrent review be completed by the US Environmental Protection Agnecy (EPA) and the California Department of Pesticide Regulation (CDPR) for the herbicide **Alion Complete**.

We would highly encourage CDPR to conduct a concurrent review with EPA to ensure that crop protection products are introduced to the marketplace in the most effective and timely manner. As products are regulated or removed from the market place growers, including our membership, are left with a few amount of products creating issues including increased resistance to the existing products. Alion Complete, a co-formulation of indzaiflam (Alion) with rimsulfuron (Dupont Matrix SG), requires a lesser amount of product applied than with the original Alion formulation but provides equal effectiveness in weed management. Our growers would greatly benefit from having Alion Complete available to them at the earliest available time, as it offers a "built in" herbicide resistance management given its co-formulation of Alion and Dupont Matrix SG.

Thank you for reviewing our request for CDPR and EPA to conduct a concurrent review for Alion Complete. WAPA sees great value in both agencies working in coordination to bring a product that provides growers an effective, reliable and safe product to ensure sustainable, long-term weed management.

Sincerely,

Jodi Raley
Director of Regulatory Affairs

Appendix 4

Weed Science Society of America - Herbicide Site of Action (SOA) Classification List
Date last modified: 5 December 2018
For questions, contact Dr. Scott Senseman at 'ssensema@utk.edu'
http://wssa.net/wssa/weed/herbicides/

Herbicide	Class	Site of Action	Chemical Family
alloxydim	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Cyclohexanedione ('DIMs')
butroxydim	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Cyclohexanedione ('DIMs')
clethodim	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Cyclohexanedione ('DIMs')
clodinafop-propargyl	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
cycloxydim	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Cyclohexanedione ('DIMs')
cyhalofop-butyl	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
diclofop	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
fenoxaprop-P	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
fluazifop-P	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
haloxyfop	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
metamifop	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
pinoxaden	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Phenylpyrazoline ('DEN')
propaquizafop	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
quizalofop-P	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Aryloxyphenoxy-propionate ('FOPs')
sethoxydim	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Cyclohexanedione ('DIMs')
tepraloxydim	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Cyclohexanedione ('DIMs')
tralkoxydim	1(A)	Acetyl CoA Carboxylase (ACCase) Inhibitor	Cyclohexanedione ('DIMs')
amidosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
azimsulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
bensulfuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
bispyribac-sodium	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Pyrimidinyl(thio)benzoate
chlorimuron-ethyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
chlorsulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
cinosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
cloransulam-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Triazolopyrimidine
cyclosulfamuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
diclosulam	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Triazolopyrimidine
ethametsulfuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
ethoxysulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
flazasulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
florasulam	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Triazolopyrimidine
flucarbazone-sodium	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylaminocarbonyl-triazolinone
flucetosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
flumetsulam	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Triazolopyrimidine
flupyrsulfuron-methyl-sodium	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
foramsulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea

Appendix 4

Weed Science Society of America - Herbicide Site of Action (SOA) Classification List (cont'd)
Date last modified: 5 December 2018
For questions, contact Dr. Scott Senseman at 'ssensema@utk.edu'
http://wssa.net/wssa/weed/herbicides/

halosulfuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
imazamethabenz methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Imidazolinone
imazamox	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Imidazolinone
imazapic	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Imidazolinone
imazapyr	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Imidazolinone
imazaquin	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Imidazolinone
imazethapyr	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Imidazolinone
imazosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
iodosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
mesosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
metazosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
metsulfuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
nicosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
penoxsulam	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Triazolopyrimidine
primisulfuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
propoxycarbazone-sodium	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylaminocarbonyl-triazolinone
prosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
pyrazosulfuron-ethyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
pyribenzoxim	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Pyrimidinyl(thio)benzoate
pyrimisulfan	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Pyrimidinyl(thio)benzoate
pyrithiobac-sodium	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Pyrimidinyl(thio)benzoate
pyroxsulam	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Triazolopyrimidine
rimsulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
sulfometuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
sulfosulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
thiencarbazone-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylaminocarbonyl-triazolinone
thifensulfuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
triasulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
tribenuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
trifloxysulfuron	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea

Appendix 4

Weed Science Society of America - Herbicide Site of Action (SOA) Classification List (cont'd)
Date last modified: 5 December 2018
For questions, contact Dr. Scott Senseman at 'ssensema@utk.edu'
http://wssa.net/wssa/weed/herbicides/

triflusulfuron-methyl	2(B)	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) inhibitor	Sulfonylurea
benefin	3(K1)	Inhibitor of microtubule assembly	Dinitroaniline
trifluralin	3(K1)	Inhibitor of microtubule assembly	Dinitroaniline
DCPA	3(K1)	Inhibitor of microtubule assembly	Benzoic acid
dithiopyr	3(K1)	Inhibitor of microtubule assembly	Pyridine
ethalfluralin	3(K1)	Inhibitor of microtubule assembly	Dinitroaniline
oryzalin	3(K1)	Inhibitor of microtubule assembly	Dinitroaniline
pendimethalin	3(K1)	Inhibitor of microtubule assembly	Dinitroaniline
prodiamine	3(K1)	Inhibitor of microtubule assembly	Dinitroaniline
pronamide	3(K1)	Inhibitor of microtubule assembly	Benzamide
thiazopyr	3(K1)	Inhibitor of microtubule assembly	Pyridine
2,4-D	4(O)	Synthetic Auxin	Phenoxy-carboxylic-acid
2,4-DB	4(O)	Synthetic Auxin	Phenoxy-carboxylic-acid
aminocyclopyrachlor	4(O)	Synthetic Auxin	Pyrimidine-carboxylic-acid
aminopyralid	4(O)	Synthetic Auxin	Pyridine carboxylic acid
clopyralid	4(O)	Synthetic Auxin	Pyridine carboxylic acid
dicamba	4(O)	Synthetic Auxin	Benzoic acid
dichlorprop	4(O)	Synthetic Auxin	Phenoxy-carboxylic-acid
fluroxypyr	4(O)	Synthetic Auxin	Pyridine carboxylic acid
halauxifen methyl	4(O)	Synthetic Auxin	
MCPA	4(O)	Synthetic Auxin	Phenoxy-carboxylic-acid
MCPB	4(O)	Synthetic Auxin	Phenoxy-carboxylic-acid
mecoprop	4(O)	Synthetic Auxin	Phenoxy-carboxylic-acid
picloram	4(O)	Synthetic Auxin	Pyridine carboxylic acid
quinclorac	4(O)	Synthetic Auxin	Quinoline carboxylic acid
triclopyr	4(O)	Synthetic Auxin	Pyridine carboxylic acid
ametryn	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
amicarbazone	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazolinone
atrazine	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
bromacil	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Uracil
cyanazine	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
desmedipham	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Phenyl-carbamate
desmetryn	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
hexazione	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazinone
metamitron	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazinone
metoxuron	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Urea
metribuzin	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazinone
phenmedipham	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Phenyl-carbamate
prometon	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
prometryn	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine

Appendix 4

Weed Science Society of America - Herbicide Site of Action (SOA) Classification List (cont'd)
Date last modified: 5 December 2018
For questions, contact Dr. Scott Senseman at 'ssensema@utk.edu'
http://wssa.net/wssa/weed/herbicides/

propazine	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
pyrazon	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Pyridazinone
simazine	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
simetryn	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
terbacil	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Uracil
terbumeton	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
terbuthylazine	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
trietazine	5(C1)	Inhibitor of photosynthesis at photosystem II site A	Triazine
bentazon	6(C3)	Inhibitor of photosynthesis at photosystem II site B	Benzothiadiazinone
bromoxynil	6(C3)	Inhibitor of photosynthesis at photosystem II site B	Nitrile
ioxynil	6(C3)	Inhibitor of photosynthesis at photosystem II site B	Nitrile
pyridate	6(C3)	Inhibitor of photosynthesis at photosystem II site B	Phenyl-pyridazine
chlorotoluron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
dimefuron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
diuron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
fluometuron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
isoproturon	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
linuron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
methibenzuron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
monolinuron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
propanil	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Amide
siduron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
tebuthiuron	7(C2)	Inhibitor of photosynthesis at photosystem II site A; different behavior from group 5	Urea
bensulide	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Phosphorodithioate
butylate	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
cycloate	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
EPTC	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
esprocarb	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
ethofumesate	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Benzofuran
molinate	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
pebulate	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
prosulfocarb	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
thiobencarb	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate

Appendix 4

Weed Science Society of America - Herbicide Site of Action (SOA) Classification List (cont'd)
Date last modified: 5 December 2018
For questions, contact Dr. Scott Senseman at 'ssensema@utk.edu'
http://wssa.net/wssa/weed/herbicides/

triallate	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
vernolate	8(N)	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate
glyphosate	9(G)	Inhibitor of 5-enolypyruvyl-shikimate-3-phosphate synthase (EPSPS)	Glycine
glufosinate	10(H)	Inhibitor of glutamine synthetase	Phosphinic acid
aclonifen	11(F3)	Inhibitor of carotenoid biosynthesis (unknown target)	Diphenylether
amitrole	11(F3)	Inhibitor of carotenoid biosynthesis (unknown target)	Triazole
beflubutamid	12(F1)	Inhibitor of phytoene desaturase (PDS)	
diflufenican	12(F1)	Inhibitor of phytoene desaturase (PDS)	Pyridinecarboxamide
fluridone	12(F1)	Inhibitor of phytoene desaturase (PDS)	
flurochloridone	12(F1)	Inhibitor of phytoene desaturase (PDS)	
flurtamone	12(F1)	Inhibitor of phytoene desaturase (PDS)	
norflurazon	12(F1)	Inhibitor of phytoene desaturase (PDS)	Pyridazinone
picolinafen	12(F1)	Inhibitor of phytoene desaturase (PDS)	Pyridinecarboxamide
clomazone	13(F3)	Inhibitor of 1-deoxy-D-xyulose 5-phosphate sunthatase (DOXP synthase)	Isoxazolidinone
aclifluorfen	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Diphenylether
azafenidin	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Triazolinone
bifenox	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Diphenylether
butafenacil	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Pyrimidinedione
carfentrazone-ethyl	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Triazolinone
flufenpyr-ethyl	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	
flumiclorac	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	N-phenylphthalimide
flumioxazin	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	N-phenylphthalimide
fluoroglycofen	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Diphenylether
fluthiacet-methyl	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Thiadiazole
fomesafen	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Diphenylether
lactofen	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Diphenylether
oxadiargyl	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Oxadiazole
oxadiazon	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Oxadiazole
oxyfluorfen	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Diphenylether
pyraflufen-ethyl	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Phenylpyrazole
saflufenacil	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Pyrimidinedione

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http://wssa.net/wssa/weed/herbicides/

sulfentrazone	14(E)	Inhibitor of protoporphyrinogen oxidase (Protox, PPO)	Triazolinone
acetochlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
alachlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
anilofos	15(K3)	Mitosis Inhibitor	
butachlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
dimethenamid	15(K3)	Mitosis Inhibitor	Chloroacetamide
fentrazamide	15(K3)	Mitosis Inhibitor	Tetrazolinone
flufenacet	15(K3)	Mitosis Inhibitor	Oxyacetamide
mefenacet	15(K3)	Mitosis Inhibitor	Oxyacetamide
metazachlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
napropamide	15(K3)	Mitosis Inhibitor	Acetamide
pretilachlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
propachlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
pyroxasulfone	15(K3)	Mitosis Inhibitor	Isoxazoline
S-metolachlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
thenylchlor	15(K3)	Mitosis Inhibitor	Chloroacetamide
asulam	18(I)	Inhibitor of 7,8-dihydro-preroate synthetase (DHP)	Carbamate
diflufenzopyr	19(P)	Inhibitor of indoleacetic acid transport	Phthalamate Semicarbazone
naptalam	19(P)	Inhibitor of indoleacetic acid transport	Phthalamate Semicarbazone
dichlobenil	20(L)	Inhibitor of cell wall synthesis site A	Nitrile
isoxaben	21(L)	Inhibitor of cell wall synthesis site B	Benzamide
diquat	22(D)	Photosystem I electron diverter	Bipyridylium
paraquat	22(D)	Photosystem I electron diverter	Bipyridylium
carbetamide	23(K2)	Inhibitor of mitosis	Carbamate
dinoterb	24(M)	Membrane disruptor (uncouplers)	Dinitrophenol
dazomet	26(Z)	Unknown site of action	
difenzoquat	26(Z)	Unknown site of action	Pyrazolium
metham	26(Z)	Unknown site of action	
pelargonic acid	26(Z)	Unknown site of action	
benzofenap	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	Pyrazole
benzobicyclon	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	Benzoylbicyclooctanedione
isoxaflutole	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	
mesotrione	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	Triketone
pyrazolynate	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	Pyrazole
pyrazoxyfen	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	Pyrazole
sulcotrione	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	Triketone
tembotrione	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	Triketone

Appendix 4

Weed Science Society of America - Herbicide Site of Action (SOA) Classification List (cont'd)
Date last modified: 5 December 2018
For questions, contact Dr. Scott Senseman at 'ssensema@utk.edu'
http://wssa.net/wssa/weed/herbicides/

topramezone	27(F2)	Inhibitor of 4-hydroxyphenyl-pyruvatedioxygenase (4-HPPD)	
DSMA	28(Z)	Unknown site of action	Organoarsenical
fosamine	28(Z)	Unknown site of action	
MSMA	28(Z)	Unknown site of action	Organoarsenical
indaziflam	**29(L)**	**Inhibitor of cell wall synthesis site C**	
cinmethylin	30(R)	Tyrosine Aminotransferase	
methiozolin	30(R)	Tyrosine Aminotransferase	
acrolein	NC	Not Classified	
AMS	NC	Not Classified	
benazolin	NC	Not Classified	
benoxacor	NC	Not Classified	
cacodylic acid	NC	Not Classified	
cloquintocet-mexyl	NC	Not Classified	
copper chelate	NC	Not Classified	
copper sulfate	NC	Not Classified	
cyprosulfamide	NC		
dichlormid	NC	Not Classified	
dietholate	NC	Not Classified	
dimethipin	NC	Not Classified	
endothall	NC	Not Classified	
fenchlorazole-ethyl	NC	Not Classified	
fenclorim	NC	Not Classified	
fluxofenim	NC	Not Classified	
maleic hydrazide	NC	Not Classified	
mefenpyr-diethyl	NC	Not Classified	
mefluidide	NC	Not Classified	
metaborate	NC	Not Classified	
oxaziclomefone	NC	Not Classified	
sodium chlorate	NC	Not Classified	

Appendix 5

The IR-4 Project

Pest Management Solutions for Specialty Crops and Minor Uses

IR-4 Headquarters
Rutgers, The State University of New Jersey
500 College Road East, Suite 201 W
Princeton, NJ 08540
732.932.9575
fax: 609.514.2612
www.ir4.rutgers.edu

February 18, 2016

Ms. Barbara Madden
Minor Use Officer
US EPA OPP/Proc Desk (REGFEE)
Room S-4900
2777 S. Crystal Drive
Arlington, VA 22202

Dear Ms. Madden:

Submission of IR-4 indaziflam studies on coffee, caneberry, blueberry (highbush) and hops proposing a tolerance for indaziflam use in the production of Coffee, green bean, Caneberry subgroup 13-07A, Bushberry subgroup 13-07B, Hop, dried cones and crop group conversions and expansions

RE: Indaziflam
Indaziflam 200SC Herbicide, EPA Reg. No. 264-1106
(alternate brand name Alion Herbicide)
Indaziflam 500SC Herbicide, EPA Reg. No. 264-1105

IR-4 Public Interest Finding:

(1) The coffee, caneberry, blueberry (highbush) and hops data being submitted was developed by IR-4.
(2) The active ingredient, indaziflam, is already registered on other food crops.
(3) The active ingredient/crop combinations of PR 10654 indaziflam / coffee, PR 10882 indaziflam / blueberry, PR 10909 indaziflam / caneberry and PR 11071 indaziflam / hops were pre-screened by EPA because the studies were initiated in 2011 to 2013.
(4) The uses on coffee, caneberry, blueberry (highbush) and hops are from crops grown on less than 300,000 acres.

A Section 3 registration of indaziflam (marketed as Indaziflam 200SC Herbicide, Alion Herbicide and Indaziflam 500SC Herbicide) on coffee, caneberry, blueberry (highbush) and hops can provide many benefits for control of annual and perennial weeds. This Group 29 herbicide provides preemergence, residual control of both annual grasses and broadleaf weeds. Please see **Appendix 1** for an explanation of benefits of the proposed uses.

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

New Uses	Supporting Data	
Tolerance Requested	IR-4 PR Numbers	Source of New Tolerance
Coffee, green bean	10654	IR-4 coffee residue data
Caneberry subgroup 13-07A	10909	IR-4 blackberry and raspberry residue data
Bushberry subgroup 13-07B	10882	IR-4 blueberry (highbush) residue data
Hop, dried cones	11071	IR-4 hop residue data
Fruit, stone, group 12-12	11654	Conversion of the currently established tolerance on Fruit, stone, group 12 to Fruit, stone, group 12-12
Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	11655	Expansion of the currently established tolerance on Grape to Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F
Nut, tree, group 14-12	11656	Conversion of the currently established tolerance on Nut, tree, group 14 to Nut, tree, group 14-12
Individual crops of proposed Crop Subgroup 23A. Small fruit, edible peel subgroup including: Acerola; African plum; agritos, almondette; appleberry; arbutus berry; bayberry, red; bignay; breadnut; cabeluda; carandas-plum; Ceylon iron wood; Ceylon olive; cherry-of-the-Rio-Grande; Chinese olive, black; Chinese olive, white; chirauli-nut; cocoplum; desert-date; false sandalwood; fragrant manjack; gooseberry, Abyssinian; gooseberry, Ceylon; gooseberry, otaheite; governor's plum; grumichama; guabiroba; guava berry; guava, Brazilian; guava, Costa Rican; guayabillo; illawarra plum; Indian-plum; Jamaica-cherry; jambolan; kaffir-plum; kakadu plum; kapundung; karnada; lemon aspen; mombin, yellow; monos plum; mountain cherry; olive; persimmon, black; pitomba; plum-of-Martinique; rukam; rumberry; sea grape; sete-capotes; silver aspen; water apple; water pear; water berry; wax jambu.	11868	Expansion from olive to individual crops of proposed Crop Subgroup 23A. Small fruit, edible peel subgroup

Fee Category:
R-190 - $396,742
R-175 - $66,124 (see following IR-4 Exemption Request)

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

Regarding the conversion from Fruit, stone, group 12 to Fruit, stone, group 12-12, the conversion from Nut, tree, group 14 to Nut, tree, group 14-12, the expansion from grape to Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F, caneberry to Caneberry subgroup 13-07A, blueberry (highbush) to Bushberry subgroup 13-07B, and Olive to individual crops of proposed Crop Subgroup 23A. Small fruit, edible peel subgroup, IR-4 believes the that technically these submissions are "agency initiated actions" since in the Crop Grouping Final Rule (FRN 77 No.163, August 22, 2012), EPA requests that petitioners seek tolerances under the new crop grouping system or, alternatively, EPA will address the conversion on its own. Secondly, stakeholders and the public will benefit from actions such as these because many additional minor use crops will be covered by the new crop grouping system tolerances. Third, the new crop group structure will enhance maximum residue limit (MRL) enforcement efforts by FDA since the new naming system is more precise than the old naming convention.

The undersigned, Raymond C. Leonard, Coordinator, Interregional Research Project No. 4, The State University of New Jersey, Princeton, New Jersey 08540, on behalf of the IR-4 Project and the Agricultural Experiment Stations of the states of Hawaii (coffee), Georgia, Washington, New Jersey and Oregon (blueberry (highbush)), Utah, Arkansas, Georgia, Washington and Oregon (caneberry), Idaho, Washington and Oregon (hops) submits this petition pursuant to Section 408(e) of the Federal Food, Drug and Cosmetic Act, as amended, with respect to the pesticide chemical, indaziflam, (40 CFR 180.653).

As per the Pesticide Registration Improvement Act, the IR-4 tolerance petition for indaziflam (40 CFR 180.653) in/on coffee, blueberry (highbush), caneberry and hops are in the public interest and therefore exempt from the registration services fee. IR-4 in cooperation with the registrant, Bayer CropScience, requests an exemption of the registration services fee for this tolerance petition

List of Studies Submitted with this letter in Support of Proposed Tolerances for indaziflam (40 CFR 180.653) in/on coffee, blueberry (highbush), caneberry and hops.

Vol. #	Volume Title	MRID No. / PP No.
1	Indaziflam Petition (Administrative Volume) Proposing a Tolerance for Indaziflam Use in the Production of Coffee, green bean, Caneberry subgroup 13-07A, Bushberry subgroup 13-07B, Hop, dried cones and Crop Group Conversions and Expansions	---
2	Indaziflam: Magnitude of the Residue on Coffee	49752801
3	Indaziflam: Magnitude of the Residue on Blueberry (Highbush)	49752802
4	Indaziflam: Magnitude of the Residue on Caneberry	49752803
5	Indaziflam: Magnitude of the Residue on Hops	49752804

The entire submission is being made as an electronic submission only using EPA's CDX Pesticide Submission Portal (PSP).

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

Enclosed in this submission are the Administrative Volume, the Data Volumes, Notice of Filing, the Letter of Authorization (dated January 22, 2016) and the following listed below:

For the technical product:
Indaziflam Technical

- EPA Form 8570-1 (Rev. 3-94) for Indaziflam Technical (EPA Reg. No. 264-1129)
- EPA Form 8570-34 (Rev. 12-2003) Certification with Respect to Citation of Data for Indaziflam Technical (EPA Reg. No. 264-1129)
- EPA Form 8570-35 (Rev. 12-2003) Data Matrix (EPA copy) for Indaziflam Technical (EPA Reg. No. 264-1129)
- EPA Form 8570-35 (Rev. 12-2003) Data Matrix (Public copy) for Indaziflam Technical (EPA Reg. No. 264-1129)
- Indaziflam Technical label (black and white copy) (EPA Reg. No. 264-1129)
- Indaziflam Technical label (highlighted copy) (EPA Reg. No. 264-1129)

For the end use product:
Indaziflam 200SC Herbicide (alternate brand name Alion Herbicide)

- EPA Form 8570-1 (Rev. 3-94) for Indaziflam 200SC Herbicide (EPA Reg. No. 264-1106)
- EPA Form 8570-34 (Rev. 12-2003) Certification with Respect to Citation of Data for Indaziflam 200 SC Herbicide (EPA Reg. No. 264-1106)
- EPA Form 8570-35 (Rev. 12-2003) Data Matrix (EPA copy) for Indaziflam 200SC Herbicide (EPA Reg. No. 264-1106)
- EPA Form 8570-35 (Rev. 12-2003) Data Matrix (Public copy) for Indaziflam 200SC Herbicide (EPA Reg. No. 264-1106)
- Proposed Section 3 label (black and white copy) for Indaziflam 200SC Herbicide (EPA Reg. No. 264-1106)
- Proposed Section 3 label (highlighted copy) for Indaziflam 200SC Herbicide (EPA Reg. No. 264-1106)
- Supplemental label for Indaziflam 200SC Herbicide; ABN: Alion Herbicide (EPA Reg. No. 264-1106)

For the end use product:

Indaziflam 500SC Herbicide

- EPA Form 8570-1 (Rev. 3-94) for Indaziflam 500SC Herbicide (EPA Reg. No. 264-1105)
- EPA Form 8570-34 (Rev. 12-2003) Certification with Respect to Citation of Data for Indaziflam 500SC Herbicide (EPA Reg. No. 264-1105)
- EPA Form 8570-35 (Rev. 12-2003) Data Matrix (EPA copy) for Indaziflam 500SC Herbicide (EPA Reg. No. 264-1105)
- EPA Form 8570-35 (Rev. 12-2003) Data Matrix (Public copy) for Indaziflam 500SC Herbicide (EPA Reg. No. 264-1105)

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

- Proposed Section 3 label (highlighted copy) for Indaziflam 500SC Herbicide (EPA Reg. No. 264-1105)
- Proposed Section 3 label (black and white copy) for Indaziflam 500SC Herbicide (EPA Reg. No. 264-1105)

For the neurotoxicity study requirement, Bayer CropScience submitted neurotoxicity studies (MRID 47443310, 47443309, 47443289) for indaziflam. These studies were previously submitted by Bayer CropScience to EPA. MRID numbers were provided to IR-4 via email and not via the 8570-35 forms that were submitted with this petition.

For the immunotoxicity study requirement, Bayer CropScience submitted a immunotoxicity study (MRID 47443313) for indaziflam. This study was previously submitted by Bayer CropScience to EPA. These MRID numbers were provided to IR-4 via email and not via the 8570-35 forms that were submitted with this petition.

Please see the following table for a comparison of tolerances / MRLs (in ppm) for the U.S. and Canada. There are no Codex tolerances for indaziflam according to http://www.codexalimentarius.net.

Crop / Commodity	Current U.S. Tolerance (ppm)	Proposed U.S. Tolerance (ppm)	Canadian Tolerance (ppm)
Coffee, green bean	---	0.01[1]	---[1]
Caneberry subgroup 13-07A	---	0.01[2]	---[2]
Bushberry subgroup 13-07B	---	0.01[3]	Gooseberries-0.01[3]
Hop, dried cones	---	0.03[4]	---[4]
Fruit, stone, group 12-12	0.01	0.01[5]	There are tolerances of 0.01 ppm established for crops in Fruit, stone, group 12-12 including: sweet cherries, Japanese plums, capulins, Nanking cherries, damson plums, plums, Chickasaw plums, Canada plums, peaches, Japanese apricots, tart cherries, nectarines, American plums, Klamath plums, plumcots, beach plums, fresh prune plums, sloes, cherry plums, apricots, black cherries
Nut, tree, group 14-12	0.01	0.01[6]	There are tolerances of 0.01 ppm established for crops in Nut, tree, group 14-12 including: pistachio nuts, pili nuts, bur oak nuts, peach palm nuts, pine nuts, ginkgo nuts, mongongo nuts, monkey-pot nuts, Brazilian pine nuts, butternuts, pequi nuts, English walnuts, coconuts, Brazil nuts, cajou nuts, candlenuts, chestnuts, Guiana chestnuts, pachira nuts, pecan nuts, African tree nuts, cashew nuts, Japanese horse-chestnuts, monkey puzzle nuts, chinquapin nuts, sapucaia nuts, almond nuts, okari nuts, black walnuts, beechnuts, yellowhorn nuts, hazelnuts, heartnuts, hickory nuts, coquito nuts, tropical almond nuts, dika nuts, macadamia nuts, bunya nuts

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	0.01	0.01[7]	There are tolerances of 0.01 ppm established for crops in Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F including: schisandra berries, hardy kiwifruit, maypop, Amur River grapes and grapes
Olive	0.01	0.01[8]	0.01[8]

[1] Tolerance based on calculation using the OECD Calculator on IR-4 coffee, green bean residue data. At this time, Bayer CropScience is not certain if they will ask for an import tolerance on coffee.
[2] Tolerance based on calculation using the OECD Calculator on IR-4 caneberry residue data. There were two Canadian trials conducted for this study (Jordan Station, Ontario (PMRA Region 5; Blackberry) and Langley, British Columbia (PMRA Region 12; Raspberry).
[3] Tolerance based on calculation using the OECD Calculator on IR-4 blueberry (highbush) residue data. There was one Canadian trial conducted for this study (Jordan Station, Ontario (PMRA Region 5).
[4] Tolerance based on calculation using the OECD Calculator on IR-4 hop, dried cones residue data. There was one Canadian trial conducted for this study (Dunham, Brome-Missisquoi, Quebec (PMRA Region 5B).
[5] Request for conversion of the currently established tolerance on Fruit, stone, group 12 to Fruit, stone, group 12-12.
[6] Request for conversion of the currently established tolerance on Nut, tree, group 14 to Nut, tree, group 14-12.
[7] Request for expansion of the currently established tolerance on Grape to Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F.
[8] Based on the current Olive tolerance at 0.01 ppm. Once the final rule is published, this crop will become the representative commodity for Crop Subgroup 23A. Small fruit, edible peel subgroup. Request to add all individual crops of Crop Subgroup 23A at a tolerance of 0.01 ppm and removing the current tolerance at 0.01 ppm of Olive as currently listed in e-CFR 180.653. The Pest Management Centre, Agriculture and Agri-Food Canada is not planning to submit for Crop Subgroup 23A.

Please note that the following studies were joint projects with the Pest Management Centre, Agriculture & Agri-food Canada: Indaziflam: Magnitude of the Residue on Blueberry (Highbush) (PR 10882), Indaziflam: Magnitude of the Residue on Caneberry (PR 10909) and Indaziflam: Magnitude of the Residue on Hops (PR 11071).

Please note that there is a difference in spray re-treatment intervals between the IR-4 residue protocol and the proposed label directions for Indaziflam 200SC, Alion, and Indaziflam 500SC. For all studies, a shorter spray interval was used in the IR-4 residue studies versus the proposed label directions (IR-4 residue protocols contained 30 day re-treatment intervals in hops and coffee and 60 day re-treatment intervals in caneberry and blueberry (highbush). Proposed label directions for Indaziflam 200SC, Alion, and Indaziflam 500SC list 90 day re-treatment intervals or greater). In order to further minimize the risk of crop response, Bayer CropScience extended the spray intervals and limited the rates to soil % organic matter content. These steps do not adversely affect the product's performance. Bayer CropScience has experience with this product and feels that these steps are prudent. Since the time the projects were nominated and the protocols were established, Bayer CropScience has mitigated crop response issues in several crops and now has better understanding of the compound's behavior. A lot of consultation with the Bayer CropScience field staff has gone into the Alion Herbicide (and by default also, the 500SC) label statements as they appear on the proposed label.

Please note that there is a request by Bayer CropScience to not include lowbush blueberry on the end use (Indaziflam 200SC, Alion, and Indaziflam 500SC) labels or technical label because the blueberry (highbush) study (PR 10882) consists of a separate residue protocol with a different use pattern compared to the blueberry (lowbush) study (PR 11412). In addition, the blueberry (lowbush) study was recently initiated in 2015.

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

Regarding the individual crops of proposed Crop Subgroup 23A. Small fruit, edible peel subgroup, it is the intention of Bayer CropScience to print restrict this subgroup to only the representative commoditity, olive on the commercial labels until Bayer CropScience has confirmatory information regarding crop safety on any of the other crops of interest. This is a standard practice for indaziflam and helps Bayer CropScience manage risk/liability.

For questions pertaining to the 8570 forms, the labels and the notice of filing, please contact Nancy Delaney, Bayer CropScience LP, Tel. No.: (919) 549 2080; email: Nancy.Delaney@bayer.com. For questions concerning the transmittal letter, petition and/or final study reports, please contact Raymond Leonard, IR-4, Tel. No.: (732) 932-9575 ext.4617; email: leonard@aesop.rutgers.edu.

Yours very truly,
Interregional Research Project No. 4
Petitioner

Per Raymond Leonard

Raymond Leonard
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Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

Appendix 1-Benefits of Uses

Indaziflam (as Alion 200SC, and Alion 500SC) is a relatively new herbicide currently registered for preemergence control of grass and broadleaf weeds in established tree fruit, treenut, olive, and grape (TNV) crops. It is being introduced through IR-4 petition for registration in caneberry, blueberry, hops, and coffee. Indaziflam provides extended residual preemergence control of the most common and economically important annual grass and broadleaf weeds, including populations that are resistant to glyphosate, triazine and acetolactate synthase (ALS)-inhibiting herbicides. Indaziflam is an alkylazine herbicide. It controls weeds by inhibiting cellulose biosynthesis and meristematic cell growth. Indaziflam controls weeds prior to emergence from the soil, has limited postemergence (foliar) activity and may be mixed with postemergence herbicides to control existing vegetation.

Indaziflam offers significant advantages over other herbicides registered for established TNV crops. Research results and commercial use show that indaziflam provides excellent crop tolerance and extended residual control equal to or longer than all other registered products tested at recommended use rates. Growers now use indaziflam as the "base" herbicide to provide several months of residual broad spectrum weed control. Prescription weed control is achieved by using indaziflam alone or in tankmix combination with other preemergence and/or postemergence herbicides, depending on field needs. In many instances, indaziflam's extended, broad spectrum activity enable growers to reduce the number of preemergence and/or postemergence herbicide applications necessary to achieve season-long economic weed control.

Indaziflam is applied at lower application rates than many of the other registered preemergence herbicides. Displacement of these products simplifies mixing and loading operations and reduces the pounds of herbicide active ingredients applied to TNV crops. Crop safety from leaching on coarse-textured soils and groundwater restrictions are an issue with several of the other registered preemergence herbicide alternatives. Indaziflam has a lower leaching potential than most of the registered alternatives and poses less risk of crop injury on coarse textured soils. Consequently, indaziflam has minimal soil texture, or pH restrictions, and no groundwater restrictions.

Indaziflam will benefit the caneberry, blueberry, hops, and coffee industries because it will reduce overdependence and overuse of "at risk" herbicides such as glyphosate and rimsulfuron (an ALS-inhibitor herbicide). Fleabane, horseweed and Italian ryegrass have developed resistance to glyphosate in TNV crops in California and other areas. To control glyphosate-resistant weed populations, growers have increased use of residual herbicides such as flumioxazin and rimsulfuron, as well as, non-glyphosate postemergence herbicides. Unfortunately, repeated use of any herbicide mode of action increases the risk of resistance development which deprives growers of effective herbicide alternatives for control. ALS-inhibiting herbicides, such as rimsulfuron, in particular, are at high risk for resistance development, and weeds resistant to ALS, protoporphyrinogen (PPO), photosystem II (PSII) inhibitor, and bipyridilium herbicides have been identified in other crops in the U.S. Effective new herbicides are needed to manage serious resistance issues in TNV crops. Indaziflam will improve long-term resistance management and protect the longevity of all herbicides used in caneberry, blueberry, hops, and coffee.

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Broad spectrum control, effectiveness, extended control, novel mode-of-action with no known cross-resistance, and favorable human health and ecological profiles make indaziflam an excellent fit in Integrated Pest Management (IPM) and integrated weed management (IWM) programs. Indaziflam will be a welcome entry into the weed control arena for caneberry, blueberry, hops, and coffee.

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

Appendix 6

The IR-4 Project
Pest Management Solutions for Specialty Crops and Minor Uses

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May 11, 2018

Tawanda Maignan
Branch Chief (Acting)
Document Processing Desk (REGFEE)
Office of Pesticide Programs – (7504P)
2777 Crystal Drive
Arlington, VA 22202

Dear Ms. Maignan:

Submission of the Joint IR-4-Agriculture and Agri-Food Canada Indaziflam Study on Lowbush Blueberry and Uses on Fruit, tropical and subtropical, edible peel, group 23 and Fruit, tropical and subtropical, inedible peel, group 24 based on a ChemSAC decision

RE: Indaziflam
Indaziflam 200SC Herbicide (also known as Alion® Herbicide), EPA Reg. No. 264-1106
Indaziflam Technical, EPA Reg. No. 264-1129

IR-4 Public Interest Finding:

(1) The lowbush blueberry data being submitted was developed by IR-4 and Agriculture and Agri-Food Canada. The requests for uses on Fruit, tropical and subtropical, edible peel, group 23 and Fruit, tropical and subtropical, inedible peel, group 24 were based on an IR-4 ChemSAC proposal.

(2) The active ingredient, indaziflam, is already registered on other food crops.

(3) The active ingredient/crop combination of PR # 11412 indaziflam / lowbush blueberry was pre-screened by EPA in 2015 and received a "green light" by EPA. The residue study was initiated in 2015. To support the tropical crop group uses in this petition, PR # 11692 indaziflam / pomegranate was pre-screened by EPA in 2015 and received a "green light" by EPA. PR # 11546 indaziflam / fig was pre-screened by EPA in 2016 and received a "green light" by EPA. PR # 11088 indaziflam / banana, PR # 11089 indaziflam / plantain and PR # 11090 indaziflam / pineapple were not pre-screened by EPA, since at the time, the registrant did not support the use. Reasons for why the uses on lowbush blueberry and tropical fruits should be registered in the United States can be found below.

(4) The use on lowbush blueberry is for a crop grown on less than 300,000 acres. There were a total of 82,630 acres of blueberries during the 2014 season. The use on various tropical fruit are for crops grown on less than 300,000 acres. The exact acreage of many tropical fruit crops are unknown in the U.S.

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A registration of indaziflam (marketed as Alion® Herbicide) is needed to provide control of pre-emergent and early post-emergent grass and dicot weed species in tropical fruit production. The IR-4 Project Clearance Requests were also made in order to obtain control of resistant weeds in tropical orchards/groves and remove weed biomass for potential disease control of botrytis and aflatoxin that can be a problem in higher humidity (tropical) areas.

A registration of indaziflam (marketed as Alion® Herbicide) is needed to provide control of weed populations with established herbicide resistance (hexazinone-resistant weeds) in lowbush blueberry production. Also, since the lowbush blueberry residue study was a joint study, a registration in both the U.S. and Canada will provide harmonization of MRLs. Alion has a unique mechanism of action (Group 29) not found in other herbicides registered for lowbush blueberries. Applying Alion when blueberries are dormant and before bud break could control emerging resistant weeds not controlled by previous preemergence applications of herbicides such as Velpar, Velossa or Sinbar.

New Uses	**Supporting Data**	
Tolerance Requested	IR-4 PR Number	Source of New Tolerance
Lowbush blueberry (no tolerance requested since there is an established tolerance on Bushberry subgroup 13-07B at 0.01 ppm.)	11412	Joint IR-4-Agriculture and Agri-Food Canada residue study on lowbush blueberry
Fruit, tropical and subtropical, edible peel, group 23	12378	ChemSAC proposal
Fruit, tropical and subtropical, inedible peel, group 24	12379	ChemSAC proposal

Fee Categories: R-350 - $13,226; R-190 – $396.742

(See IR-4 Exemption Request Below)

Regarding the crop group conversions and expansions, IR-4 believes the that technically these submissions are "agency initiated actions" since in the Crop Grouping Final Rule (FRN 77 No.163, August 22, 2012), EPA requests that petitioners seek tolerances under the new crop grouping system or, alternatively, EPA will address the conversion on its own. Secondly, stakeholders and the public will benefit from actions such as these because many additional minor use crops will be covered by the new crop grouping system tolerances. Third, the new crop group structure will enhance maximum residue limit (MRL) enforcement efforts by FDA since the new naming system is more precise than the old naming convention.

The undersigned, Marija Arsenovic, Ph.D.,, Interregional Research Project No. 4, The State University of New Jersey, Princeton, New Jersey 08540, on behalf of the IR-4 Project and the Agricultural Experiment Stations of the states of California, Florida and Puerto Rico (tropical fruit) and Arkansas and Maine (lowbush blueberry) submits this petition pursuant to Section 408(e) of the Federal Food, Drug and Cosmetic Act, as amended, with respect to the pesticide chemical, indaziflam (40 CFR 180.653).

As per the Pesticide Registration Improvement Act, the IR-4 tolerance petition for indaziflam (40 CFR 180.653) in/on Fruit, tropical and subtropical, edible peel, group 23, Fruit, tropical and subtropical, inedible peel, group 24 and lowbush blueberry are in the public interest and therefore exempt from the registration services fee. IR-4 in cooperation with the registrant, Bayer CropScience LP (registrant for

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Indaziflam 200SC Herbicide (also known as Alion® Herbicide) and Indaziflam Technical) requests an exemption of the registration services fee for this tolerance petition.

List of Studies Submitted with this letter in Support of Proposed Tolerances for indaziflam (40 CFR 180.653) in/on Fruit, tropical and subtropical, edible peel, group 23, Fruit, tropical and subtropical, inedible peel, group 24 and lowbush blueberry.

Vol. #	Volume Title	MRID No. / PP No.
1	Petition (Administrative Volume) Proposing A Tolerance For Indaziflam Use in the Production of Fruit, tropical and subtropical, edible peel, group 23, Fruit, tropical and subtropical, inedible peel, group 24 and Lowbush Blueberry	---
2	Indaziflam: Magnitude of the Residue on Lowbush Blueberry (PR 11412)	50419401

The entire submission is being made as an electronic submission only using EPA's CDX Pesticide Submission Portal (PSP).

Enclosed in this submission are the Administrative Volume, the Data Volume, Notice of Filing, the Letter of Authorization from Bayer CropScience LP (dated April 25, 2018) and the following listed below:

For the Indaziflam Technical product:

- EPA Form 8570-1 for Indaziflam Technical (EPA Reg. No. 264-1129)
- EPA Form 8570-34 Certification with Respect to Citation of Data for Indaziflam Technical (EPA Reg. No. 264-1129)
- EPA Form 8570-35 Data Matrix (EPA copy) for Indaziflam Technical (EPA Reg. No. 264-1129)
- EPA Form 8570-35 Data Matrix (Public copy) for Indaziflam Technical (EPA Reg. No. 264-1129)
- Indaziflam Technical label Highlighted Copy (EPA Reg. No. 264-1129)
- Indaziflam Technical label Black Copy (EPA Reg. No. 264-1129)

For the Indaziflam 200SC Herbicide (also known as Alion® Herbicide) end use product:

- EPA Form 8570-1 Application for Pesticide for Indaziflam 200SC Herbicide (also known as Alion® Herbicide) (EPA Reg. No. 264-1106)
- EPA Form 8570-34 Certification with Respect to Citation of Data for Indaziflam 200SC Herbicide (also known as Alion® Herbicide) (EPA Reg. No. 264-1106)
- EPA Form 8570-35 Data Matrix (EPA copy) for Indaziflam 200SC Herbicide (also known as Alion® Herbicide) (EPA Reg. No. 264-1106)
- EPA Form 8570-35 Data Matrix (Public copy) for Indaziflam 200SC Herbicide (also known as Alion® Herbicide) (EPA Reg. No. 264-1106)
- Proposed Master label for Indaziflam 200SC Herbicide (also known as Alion® Herbicide) Highlighted Copy (EPA Reg. No. 264-1106)
- Proposed Master label for Indaziflam 200SC Herbicide (also known as Alion® Herbicide Black Copy (EPA Reg. No. 264-1106)

Major funding for IR-4 is provided by Special Research Grants and Hatch Act Funds from USDA-CSREES, in cooperation with the State Agricultural Experiment Stations and USDA-ARS.

For the neurotoxicity study requirement, Bayer CropScience LP submitted neurotoxicity studies (MRID 47443310, 47443309, 47443289) for indaziflam. These studies were previously submitted by Bayer CropScience to EPA. MRID numbers were provided to IR-4 via email and not via the 8570-35 forms that were submitted with this petition.

For the immunotoxicity study requirement, Bayer CropScience LP submitted a immunotoxicity study (MRID 47443313) for indaziflam. This study was previously submitted by Bayer CropScience to EPA. These MRID numbers were provided to IR-4 via email and not via the 8570-35 forms that were submitted with this petition.

Please see the following table for a comparison of indaziflam tolerances / MRLs (in mg/Kg or ppm) for the U.S., Canada and Codex:

Crop / Commodity	Proposed U.S. Tolerance (Sec. F, ppm)	Current U.S. Tolerance (ppm)	Canadian Tolerance (ppm)	Codex Tolerance (mg/kg)
Fruit, tropical and subtropical, edible peel, group 23	0.01[1]	0.01[2]	Olive-0.01	---
Fruit, tropical and subtropical, inedible peel, group 24	0.01[1]	---	---	---
Bushberry subgroup 13-07B	---	0.01[3]	Gooseberry-0.01	---

[1] Please see the ChemSAC meeting minutes from October 12, 2016 regarding the decision made from the ChemSAC proposal: "Allow broader extrapolations for indaziflam herbicide, from other tree fruit, vine and bush/cane crops to cover tropical fruits" for the establishment of tolerances of the herbicide indaziflam for the control of weeds in tropical fruit.

[2] Currently, there is an established U.S. tolerance on Fruit, tropical and subtropical, small fruit, edible peel, subgroup 23A at 0.01 ppm.

[3] Please note that there is an indaziflam established tolerance on Bushberry subgroup 13-07B at 0.01 ppm. This crop subgroup includes both highbush blueberry and lowbush blueberry. The use pattern for highbush blueberry differs from the use for lowbush blueberry. However, since all residues of lowbush blueberry samples were less than the LLMV of 0.005 ppm for both indaziflam and 1-fluoro triazinediamine and 0.01 ppm for total residues, IR-4 is not requesting a separate tolerance for lowbush blueberry

Please note that a ChemSAC proposal "Allow Broader Translations for Indaziflam Herbicide from Other Tree Fruits, Vine, Bushberry, and Caneberry Crops to Cover Tolerances in Tropical Fruits" was prepared and submitted to EPA on August 31, 2016. This proposal is contained in Section D of the IR-4 petition.

The ChemSAC meeting minutes from October 12, 2016 regarding the decision made from the ChemSAC proposal are also contained in Section D of the IR-4 petition. Overall, the ChemSAC concurred with IR-4's proposal for establishing indaziflam tolerances in commodities in tropical fruit groups 23 and 24.

Section D of the IR-4 petition also contains a white paper from Bayer CropScience that summarizes existing metabolism and residue data in support of extrapolating those data to establish indaziflam crop tolerances in other perennial crops.

There is an indaziflam established tolerance on Bushberry subgroup 13-07B at 0.01 ppm. This crop subgroup includes both highbush blueberry and lowbush blueberry. The use pattern for highbush blueberry differs from the use for lowbush blueberry. However, since all residues of lowbush blueberry

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samples were less than the LLMV of 0.005 ppm for both indaziflam and 1-fluoro triazinediamine and 0.01 ppm for total residues, IR-4 is not requesting a separate tolerance for lowbush blueberry.

As noted above, the lowbush blueberry data being submitted was developed by IR-4 and Agriculture and Agri-Food Canada. Canada is planning on submitting the lowbush blueberry data to PMRA within the same time period as the U.S. submitting the lowbush blueberry data to EPA, thus allowing for a joint submission.

For questions pertaining to the 8570 forms, the labels and the notice of filing, please contact Ian Murphy, Bayer CropScience, email: ian.murphy@bayer.com. For questions concerning the transmittal letter, petition and / or final study report, please contact Marija Arsenovic, Ph.D., IR-4, Tel. No.: (732) 932-9575 ext.4609; email: marija.arsenovic@rutgers.edu.

Yours very truly,
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UC University of California Cooperative Extension

Citrus Weed Control with Indaziflam and Rimsulfuron Herbicides

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[1] University of California Cooperative Extension Ventura County; [2] University of California Riverside.

Introduction

Weeds can impact cultural operations, tree growth, and yields by altering the spray pattern of low-volume irrigation systems, intercepting soil-applied chemicals (fertilizer and agricultural chemicals), reducing grove temperatures during freeze events, and interfering with pruning and harvest operations. The presence of weeds in a citrus grove can also affect insect populations. Weeds growing around tree trunks may also create a favorable environment for pathogens that infect the trunk and roots. Weed species compete with citrus trees in many ways and with varying intensities; management of more competitive weeds such as *Conyza bonariensis* and *C. canadensis*, *Sorghum halapensis*, *Paspallum dilatatum*, and *Ipomea purpurea* should be prioritized. While some weeds (e.g., *Tribulus terrestris, Xanthium strumarium, Urtica urens, Cirsium vulgare*, and *Picris echioides*) may have low competitive effects on citrus trees, they can hinder labor operations and may also rank high for active management.

Citrus integrated pest management (IPM) programs typically utilize a combination of control practices, like cultural, mechanical, and chemical, to minimize competitive effects of weeds on crop productivity. Weed management can be an expensive part of the total citrus production program, but resources invested here can provide significant economic returns.

Proper weed identification is a critical in developing an effective management program. Weed species will vary with location, climate, season, soil type, previous site history, and current and past management programs.

A photo gallery of weeds, weed seedlings, and various weed anatomical features is available online through UC IPM at: http://www.ipm.ucdavis.edu/PMG/weeds_intro.html.

Additionally, an online identification tool is available through the UC Weed Research and Information Center at: http://weedid.wisc.edu/ca/weedid.php.

Scouting for weeds should be conducted in all areas in and near the grove, including tree rows, row middles, water furrows, ditch banks, fence rows, and adjacent perimeter locations. These sites may receive different cultural practices which can facilitate the persistence and spread of different weed species. Look for small isolated weed patches and manage them before they spread to other areas of the grove. Since weeds emerge all year long, schedule weed surveys throughout the year, especially after rains or soil disturbances. Scouting should occur even if weeds are not easily visible or their above-ground parts appear to be dead. Re-growth from perennial plants is common. If weeds are correctly identified in the seedling or vegetative stage, then proper control can be achieved through: 1) optimal treatment timing; 2) possible reduced herbicide application rate; and 3) reduced environmental impact from treatments. The weed species present will vary with season and location, because weeds are typically not distributed uniformly. For further information about characteristics used to identify, see the Weeds section of the UC IPM Citrus Pest Management Guidelines, http://www.ipm.ucdavis.edu/PMG. When scouting for weeds, records should be developed and recorded as to species abundance, location, and identity.

Preventive programs are often overlooked, but are an important component of cultural practices and are cost-effective. Practices, such as sanitation, spot spraying, and/or hand removal of weed escapes before they produce new seed are examples of prevention. While preventive programs may not stop the spread of all weed

Figure 1. Indaziflam (2 fl. oz/A) in combination with rimsulfuron at 2 fl. oz/A applied in November provided excellent weed control for up to 4 months (front) while untreated checks had high weed densities (back).

species, these practices may slow the spread of undesirable species, thereby reducing long-term weed control costs.

Cultivation or tillage has been used in the past for many years in citrus production. Tillage is an effective method of controlling annual weeds effectively by severing weed stems and roots but is can be counterproductive for perennial weeds that can propagate vegetatively. Soil erosion concerns are cited as a reason why tillage use is decreasing as more groves are planted on raised berms. Also, citrus trees have a shallow fibrous root system and tillage increases risk of root and trunk damage. With the use of low-volume irrigation systems and closer in-row planting distances, tillage in both directions is no longer possible. Mechanical mowing is generally more expensive than tillage and can throw seed under the tree canopy, increasing weed pressure next to the tree trunk.

Herbicides used in a citrus are generally divided into two groups: 1) soil-applied (preemergence) herbicides that should be applied to fairly clean soil surfaces prior to weed emergence, and 2) foliar-applied (postemergence) herbicides that are applied after weeds have emerged. Preemergence herbicides are generally applied two to three times per year, so the maximum amount of herbicide is in the upper soil profile (0 to 2 inches) slightly before peak weed emergence. Herbicides applied too early, before weeds emerge, will not provide adequate weed control due to herbicide leaching or degradation on the soil surface or within the soil profile.

Preemergence herbicides must be incorporated (mainly by rainfall or irrigation) and are usually broadcast on the entire orchard floor since growers do not know where weeds will emerge and to reduce risk of frost damage. Growers using drip irrigation or micro-sprinkler irrigation have a difficult time adequately incorporating preemergence herbicides, so usually try to treat prior to predicted rainfall (Rector et al. 1998). Soil type can influence herbicide selection and rate used. Many preemergence herbicides including oxyfluorfen, pendimethalin, oryzalin, trifluralin, and metolachlor can be used on sandy soils without injuring citrus trees. Tree age is also an important consideration when selecting which herbicide(s) to use.

Table 1. Potential injury ratings (1= none to 10= most severe) from direct spray (50 gal/acre solution) of herbicides on Satsuma mandarins.

Treatments and rates per acre	1 week after treatment	5 weeks after treatment
Untreated	1	1
Indaziflam, low concentration at 5 fl. oz	1.58	3.25
Indaziflam, low concentration at 5 fl. oz + rimsulfuron at 2 oz	2.13	3.5
Indaziflam, high concentration at 2 oz	1.54	3
Indaziflam, high concentration at 2 oz + rimsulfuron at 2 oz	1.25	2.25
Rimsulfuron at4 oz	1.75	1.75

Postemergence herbicides are used to control weeds that escape control by preemergence herbicides or mechanical cultivation. Postemergence herbicides can be systemic or contact in activity. Systemic herbicides are moved within the target plant, killing the foliage and root system of the treated plant. Contact herbicides are active only on those parts of the weeds the herbicide comes into contact with. Hence, adequate spray coverage of the weeds is more critical than with systemic materials. These herbicides are effective on small annual weeds and usually only suppress growth of perennials. It should be noted that the majority of organic herbicides are contact herbicides. Glyphosate is a systemic postemergence herbicide in widely used in citrus due to its efficacy on many weed species and relatively low cost. However, continuous use of the same mode of action over time will likely lead to the development of resistant populations in some weeds species. Amongst other weed species, *Conyza canadensis* and *C. bonariensishave* both been reported to be resistant to glyphosate in California citrus.

To help reduce the likelihood of herbicide resistance development, herbicides with different modes of action should be rotated and/or mixed. New herbicides and rotations are needed to address the increasing occurrence of resistance among weeds in citrus orchards, and provide more effective and economic, season-long control while minimizing crop injury.

Rimsulfuron is a relatively new pre-post emergence herbicide registered for use in California citrus. It has both grass and broadleaf weed activity. Indaziflam, also recently introduced to

Figure 2. Slight curling and brown spotting of new leaves from a direct spray (drift simulation) of combination of rimsulfuron with indaziflam (left) compared to untreated leaves (right) at 1 week after treatment.

California citrus, has a pre-emergence activity against many common grasses and broadleaves. Both of these materials would fit into a rotation and/or herbicide mix. In 2016 and 2017 we conducted trials evaluating the efficacy and safety of these two materials in a citrus orchard.

Materials and Methods

Weed control. At a clay loam site (pH =7.4) near Santa Paula, CA, the weed control efficacy of two product formulations of the indaziflam, (at 2 and 5 fl. oz/A)) was evaluated. These were applied alone or in combination with rimsulfuron at 2 fl. oz/A, which was also applied alone at 4 fl.oz/A, for a total of 5 treatments plus an untreated control. All of the treatments were applied to 90ft ^{2} plots either in November 2015 and 2016 or in February 2016 and 2017. Herbicide treatments were applied with a CO_2-pressurized backpack sprayer delivering spray solution via three flat nozzles in a volume equivalent to 50 gal/acre. Treatment plots in row middles had been previously treated with glyphosate and shallow cultivation. In November, no weeds germinated prior to application, while in February weeds germinated after winter rains in all plots. We evaluated weed densities at two, four, and six months after treatment (MAT).

Citrus injury potential. Even though the tested herbicides are applied to soil and should not come in contact with citrus foliage when applied properly we evaluated potential impact of herbicidal drift on citrus. In 2017 we have simulated severe drift by spraying all treatments (as described previously) to halves (aprox. 20 ft^2) of the foliage of 6-8 ft tall Satsuma mandarins. Again, treatments were arranged according to a RCBD with four replications. At one and five weeks after treatment (WAT) we rated foliar injury on a scale from 1 (none) to 10 (most severe). Averages of four independent ratings on the same date were used to conduct statistical analyses as described previously.

Results and Discussion

Weed control. The most common weeds in the plots were little mallow (*Malva parviflora*), horseweed and hairy fleabane (*Conyza* spp.), field bindweed (*Convolvulus arvensis*), spurge (*Euphorbia* spp.), common lambsquarters (*Chenopodium album*), burning nettle (*Urtica urens*) and common purslane (*Portulaca oleracea*). All of the herbicide treatments were consistently effective in controlling broadleaf weeds compared to the untreated control regardless of the evaluation period (combined weed densities shown in Fig. 4). Indaziflam at both rates plus rimsulfuron provided superior control over other treatments for most weeds in both seasons and application timings. Although spurge was not controlled with this herbicide combination, we suspect that performance may be improved with the addition of a surfactant. Common purslane and field bindweed were least susceptible to herbicide treatments. Even though there was partial control of above-ground bindweed shoots, new growth regenerated from below-ground buds was not affected. Purslane seed bank in soil provided multiple germination cohorts and the seed germinated 2-4 MAT were likely not exposed to lethal herbicide concentrations and germinated and established. The efficacy of all treatments greatly diminished between two and six MAT. Additional herbicide applications and integrated control might have provided longer-term control.

Figure 3. Significant chlorosis and discoloration, particularly on new foliage observed at 5 weeks after direct spray (drift simulation) with indaziflam (left) compared to untreated leaves (right).

Citrus injury potential. Even with direct spray to foliage all treatments resulted in very low injury ratings at 1 WAT (Table 1). Rimsulfuron alone or in combination with indaziflam had slightly greater levels of injury that indaziflam at that time. However, at 5 WAT significant injury symptoms developed in treatments containing indaziflam and injury was greater at increased rate (Table 1). However, in all cases the drift that would result from soil application of any treatments is unlikely to cause significant injury, let alone negative effects on fruit production. Thus, we conclude that these herbicides can be applied safely in young citrus groves when drift is prevented.

In summary:

- Rimsulfuron, indaziflam and their combinations controlled most broadleaf weeds germinating from soil seedbank and those dispersed by wind to citrus furrows for up to 4 months. The higher rates were slightly more efficacious than lower rates. Rimsulfuron provided some control of field bindweed (above-ground parts).
- These herbicides control germinating weeds and do not have much activity on established weeds, and may need 'burn-down' partner for complete weed management program.
- Rimsulfuron and indaziflam have different mode of action than glyphosate (controls established weeds) and therefore are good tools in both weed and resistance management in citrus orchards.
- Both herbicides were safe to citrus when applied to soil but caution should be exercised to prevent drift to crop foliage. When in contact with young leaves rimsulfuron caused minimal injury but indaziflam caused extensive chlorosis in crop canopy.
- Application prior to rainy season (November) was very effective and may be preferred to application after rains (February) when many germinated weeds are established. ■

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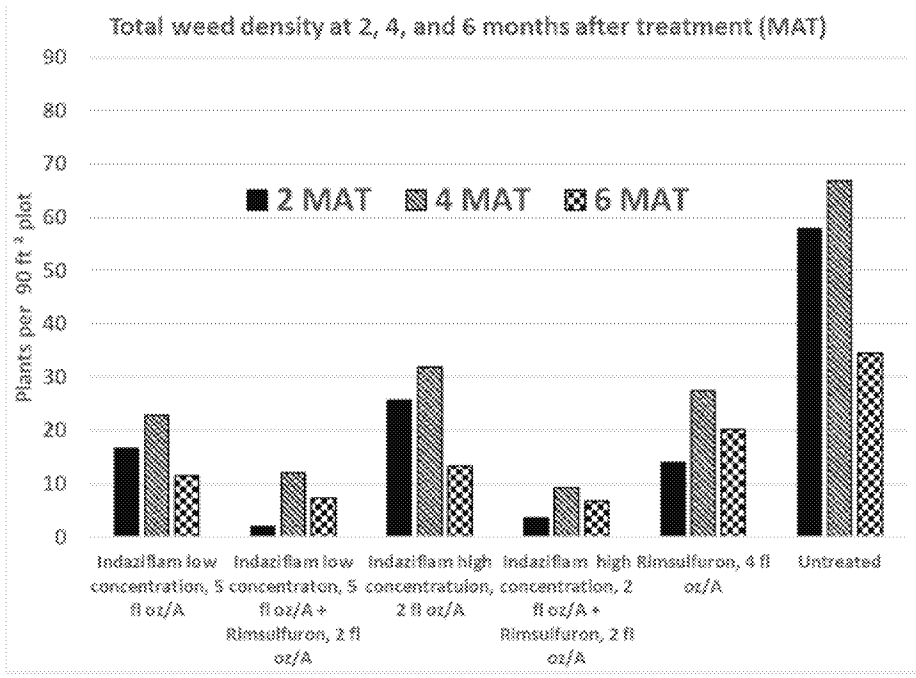

Figure 4. Total weed density per 90 ft² plot at two, four, and six months after treatment (MAT).